MediDoceo

Seminare und Fortbildungen für Ärzte

# EKG – Kurs für Anfänger

Beginn: 20:00 Uhr

## Vorbereitung auf die Kenntnisprüfung

**Achtung! Datenschutz & Urheberrecht & Persönlichkeitsrechte!**
**Jede Vervielfältigung und Weitergabe von Bildern und Tonaufnahmen dieses Kurses verstoßen gegen das Urheberrechtsgesetz, gegen die Vertraulichkeit des gesprochenen Wortes (§ 201 StGB) und gegen die DSGVO.**
**Jede Vervielfältigung und Weitergabe wird strafrechtlich verfolgt!**
**© MediDoceo**



1

Prüfungsfragen über **Aussagekraft eines EKGs**

- Lagetyp
- Herzfrequenz
- Herzrhythmus
- Vorhoftätigkeit
- Extrasystolen
- Schenkelblock
- Akuter oder abgelaufener Herzinfarkt
- Myokardhypertrophie
- Rechts – oder Linksbelastung des Herzens

MediDoceo



2

Prüfungsfragen über **EKG – Indikationen**

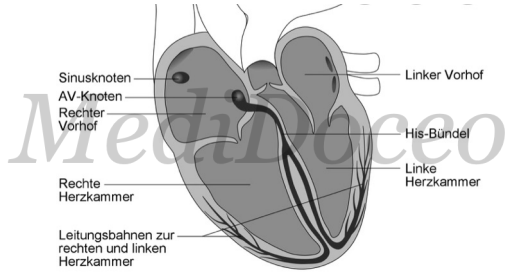
- ✓Thorakale, retrosternale Schmerzen
- ✓Herzrhythmusstörungen
- ✓Unklare Synkope
- ✓Koronare Herzkrankheit
- ✓Myokardinfarkt
- ✓Akutes Koronarsyndrom

MediDoceo



3

Prüfungsfragen zum **Reizleitungssystem des Herzens**

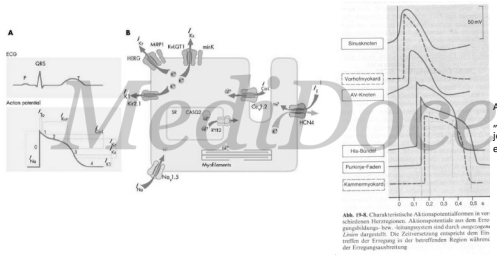



MediDoceo



4

Prüfungsfragen über Unterschied zwischen Myokardzellen Sekelettmuskelzellen: → spontane Depolarisation!



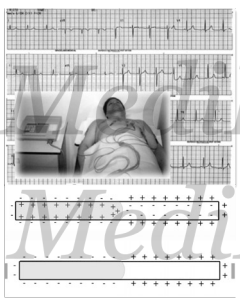


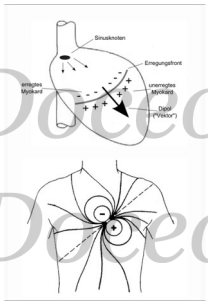
AP wir immer weniger „steil", je tiefer in Herzen es entsteht

MediDoceo



5



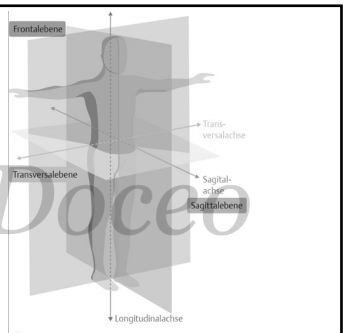



MediDoceo



6

## Prüfungsfragen über Ebenen des Körpers




MediDoceo

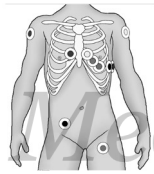
MediDoceo EKG - Kurs

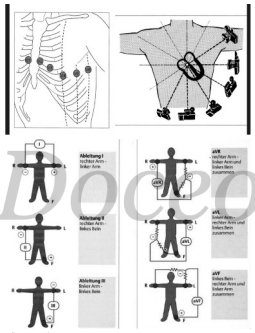
Georg Thieme Verlag, Stuttgart - New York
I care Pflege - 2020

2/6/23 7

7

## Prüfungsfragen über Ableitungen



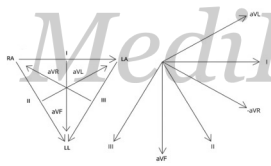


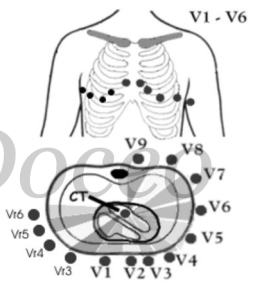
MediDoceo

06.02.23 MediDoceo EKG - Kurs 8

8

| | | | |
|---|---|---|---|
| I lateral | aVR | $V_1$ septal | $V_4$ anterior |
| II inferior | aVL lateral | $V_2$ septal | $V_5$ lateral |
| III inferior | aVF inferior | $V_3$ anterior | $V_6$ lateral |

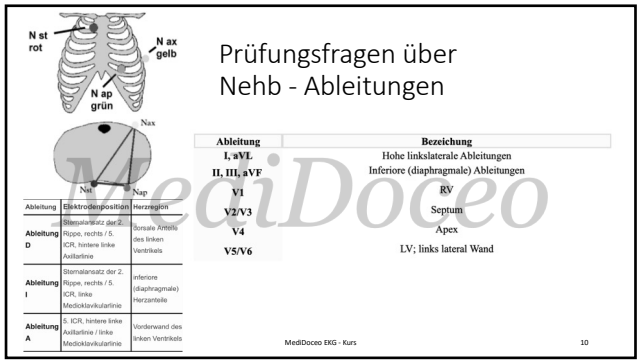




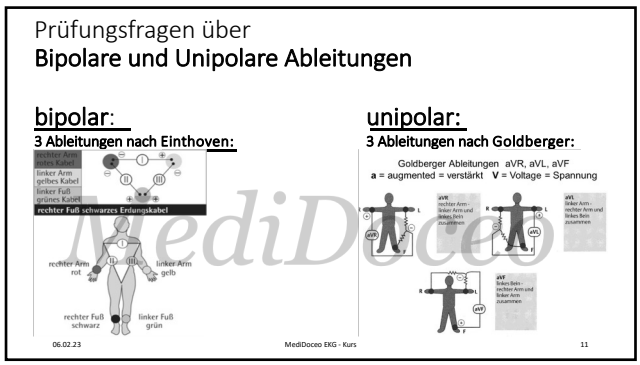

MediDoceo

06.02.23 MediDoceo EKG - Kurs 9

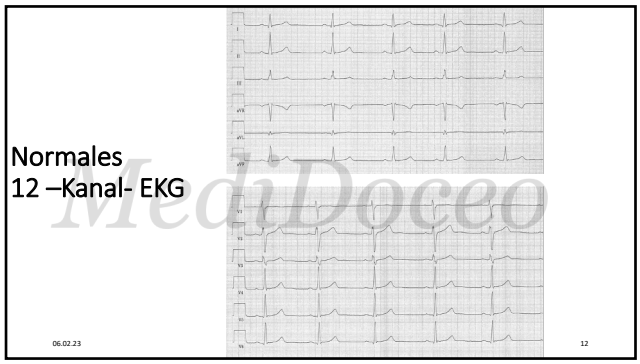
9


N st rot
N ax gelb
N ap grün
Nax
Nst
Nap
Prüfungsfragen über
Nehb - Ableitungen
Ableitung
Bezeichung
I, aVL
Hohe linkslaterale Ableitungen
II, III, aVF
Inferiore (diaphragmale) Ableitungen
V1
RV
V2/V3
Septum
V4
Apex
V5/V6
LV; links lateral Wand
Ableitung
Elektrodenposition
Herzregion
Ableitung D
Stemalansatz der 2. Rippe, rechts / 5. ICR, hintere linke Axillarlinie
Basale Anteile des linken Ventrikels
Ableitung I
Stemalansatz der 2. Rippe, rechts / 5. ICR, linke Medioklavikularlinie
inferiore (diaphragmale) Herzanteile
Ableitung A
5. ICR, hintere linke Axillarlinie / linke Medioklavikularlinie
Vorderwand des linken Ventrikels
MediDoceo EKG - Kurs
10

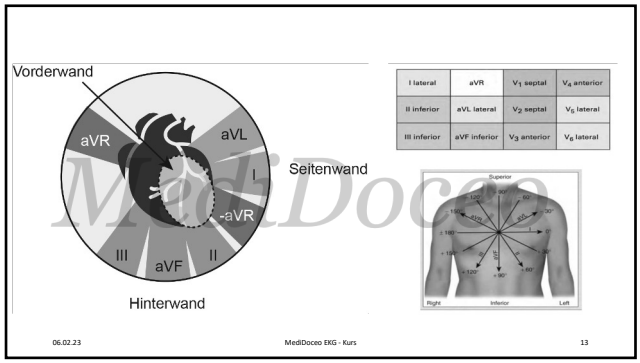
10


Prüfungsfragen über
Bipolare und Unipolare Ableitungen
bipolar:
3 Ableitungen nach Einthoven:
linker Arm gelbes Kabel
linker Fuß grünes Kabel
rechter Fuß schwarzes Erdungskabel
rechter Arm rot
linker Arm gelb
rechter Fuß schwarz
linker Fuß grün
unipolar:
3 Ableitungen nach Goldberger:
Goldberger Ableitungen aVR, aVL, aVF
a = augmented = verstärkt V = Voltage = Spannung
06.02.23
MediDoceo EKG - Kurs
11

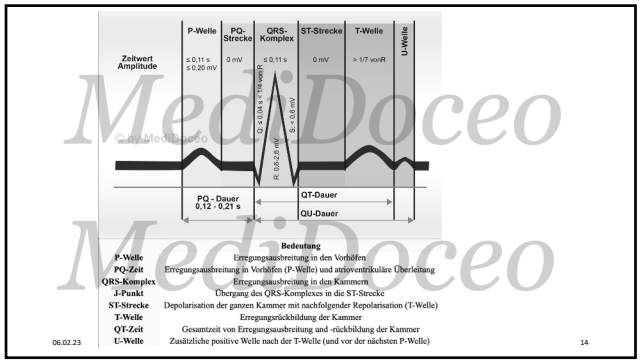
11


Normales
12 –Kanal- EKG
06.02.23
12

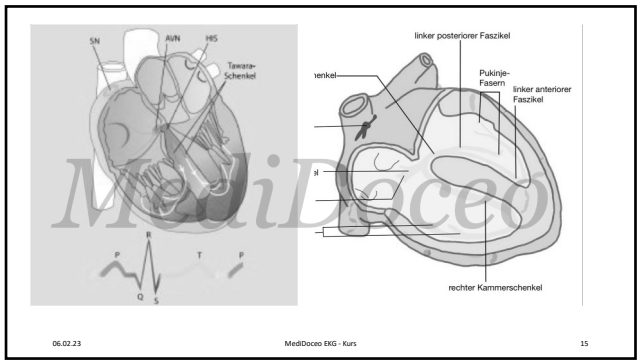
12


Vorderwand
aVR
aVL
I
-aVR
III
aVF
II
Hinterwand
Seitenwand
I lateral
aVR
V1 septal
V4 anterior
II inferior
aVL lateral
V2 septal
V5 lateral
III inferior
aVF inferior
V3 anterior
V6 lateral
Superior
Right
Inferior
Left
06.02.23
MediDoceo EKG - Kurs
13

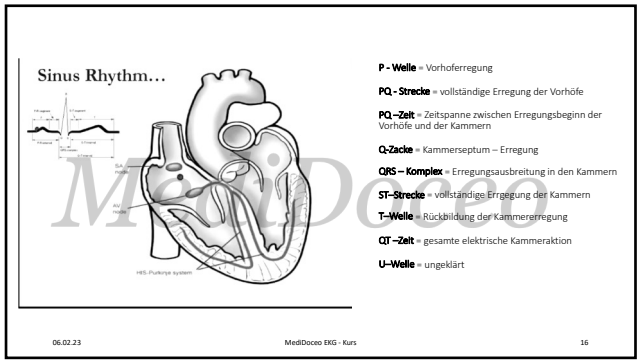
13


P-Welle
PQ-Strecke
QRS-Komplex
ST-Strecke
T-Welle
U-Welle
Zeitwert
Amplitude
≤ 0,11 s
≤ 0,20 mV
0 mV
≤ 0,11 s
0 mV
> 1/7 von R
PQ - Dauer
0,12 - 0,21 s
QT-Dauer
QU-Dauer
Bedeutung
P-Welle Erregungsausbreitung in den Vorhöfen
PQ-Zeit Erregungsausbreitung in Vorhöfen (P-Welle) und atrioventrikuläre Überleitung
QRS-Komplex Erregungsausbreitung in den Kammern
J-Punkt Übergang des QRS-Komplexes in die ST-Strecke
ST-Strecke Depolarisation der ganzen Kammer mit nachfolgender Repolarisation (T-Welle)
T-Welle Erregungsrückbildung der Kammer
QT-Zeit Gesamtzeit von Erregungsausbreitung und -rückbildung der Kammer
U-Welle Zusätzliche positive Welle nach der T-Welle (und vor der nächsten P-Welle)
06.02.23
14

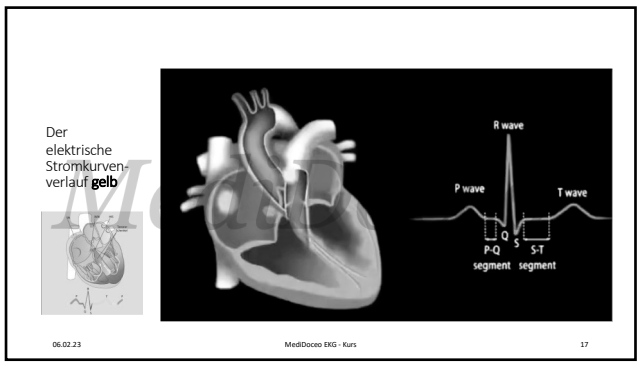
14


SN
AVN
HIS
Tawara-Schenkel
linker posterior Faszikel
Pukinje-Fasern
linker anteriorer Faszikel
rechter Kammerschenkel
R
P
T
P
Q
S
06.02.23
MediDoceo EKG - Kurs
15

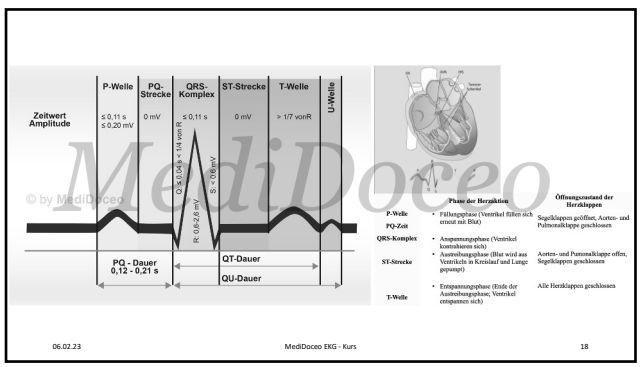
15


Sinus Rhythm…
P - Welle = Vorhoferregung
PQ - Strecke = vollständige Erregung der Vorhöfe
PQ –Zeit = Zeitspanne zwischen Erregungsbeginn der Vorhöfe und der Kammern
Q-Zacke = Kammerseptum – Erregung
QRS – Komplex = Erregungsausbreitung in den Kammern
ST–Strecke = vollständige Erregung der Kammern
T–Welle = Rückbildung der Kammererregung
QT –Zeit = gesamte elektrische Kammeraktion
U–Welle = ungeklärt
06.02.23
MediDoceo EKG - Kurs
16

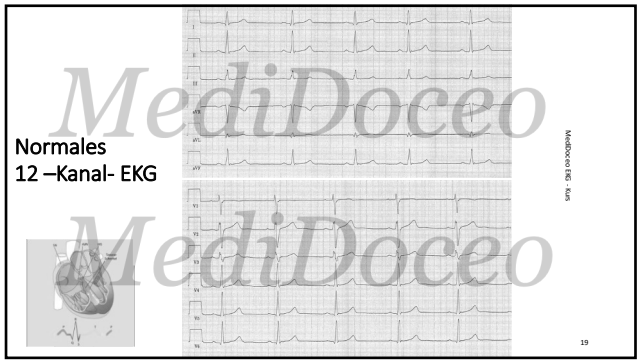
16


Der elektrische Stromkurven-verlauf gelb
R wave
P wave
T wave
Q
S
P-Q segment
S-T segment
06.02.23
MediDoceo EKG - Kurs
17

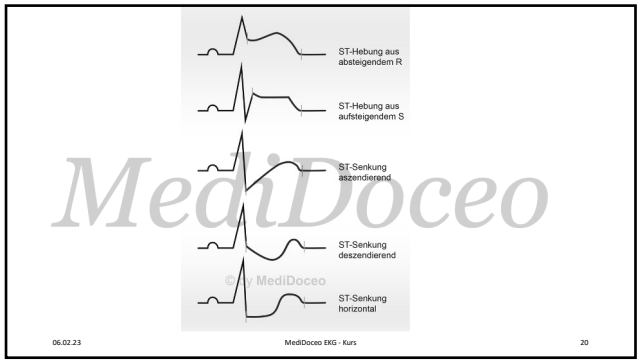
17


P-Welle
PQ-Strecke
QRS-Komplex
ST-Strecke
T-Welle
U-Welle
Zeitwert Amplitude
≤ 0,11 s
≤ 0,20 mV
0 mV
≤ 0,11 s
0 mV
> 1/7 vonR
PQ - Dauer 0,12 - 0,21 s
QT-Dauer
QU-Dauer
Phase der Herzaktion
Öffnungszustand der Herzklappen
P-Welle
Vorhöfe erregt
Segelklappen geöffnet, Aorten- und Pulmonalklappe geschlossen
PQ-Zeit
Erregungsausbreitung in den Vorhöfen
QRS-Komplex
Kammerseptum erregt
Anspannungsphase (Ventrikel kontrahieren sich)
ST-Strecke
Kammern vollständig erregt
Austreibungsphase (Blut wird aus Ventrikeln in Kreislauf und Lunge gepumpt)
Aorten- und Pulmonalklappe offen, Segelklappen geschlossen
T-Welle
Rückbildung der Kammererregung
Entspannungsphase (Ende der Austreibungsphase; Ventrikel entspannen sich)
Alle Herzklappen geschlossen
06.02.23
MediDoceo EKG - Kurs
18

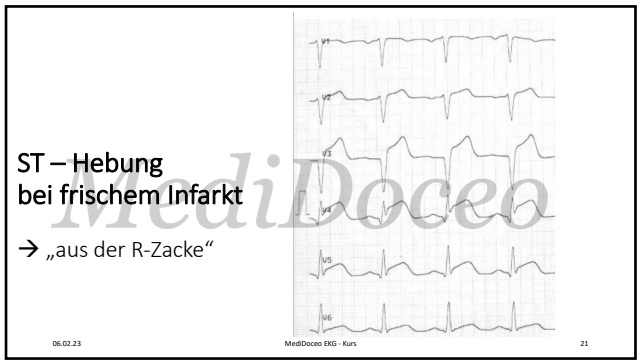
18


Normales
12 –Kanal- EKG
MediDoceo EKG - Kurs
19

19

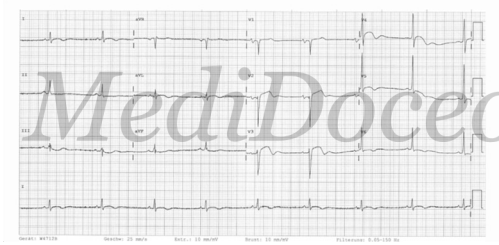

ST-Hebung aus absteigendem R
ST-Hebung aus aufsteigendem S
ST-Senkung aszendierend
ST-Senkung deszendierend
ST-Senkung horizontal
06.02.23
MediDoceo EKG - Kurs
20

20


ST – Hebung
bei frischem Infarkt
→ „aus der R-Zacke“
V1
V2
V3
V4
V5
V6
06.02.23
MediDoceo EKG - Kurs
21

21

ST – Hebung bei akuter Perikarditis
→ „aus der tiefen S-Zacke“:

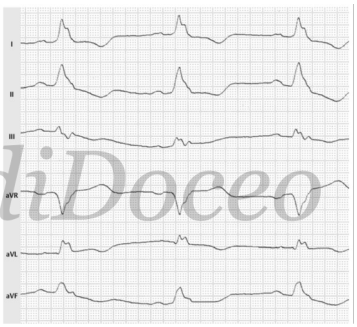



06.02.23 MediDoceo EKG - Kurs 22

22

**Beispiel:**

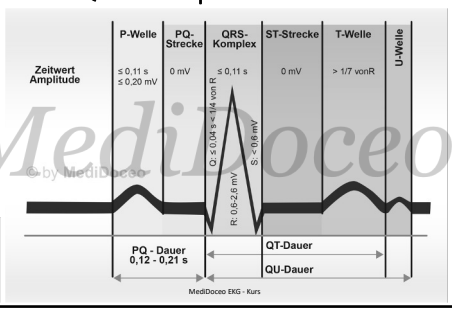
Deszendierende
ST – Streckensenkung
bei kompletten LSB




06.02.23 MediDoceo EKG - Kurs 23

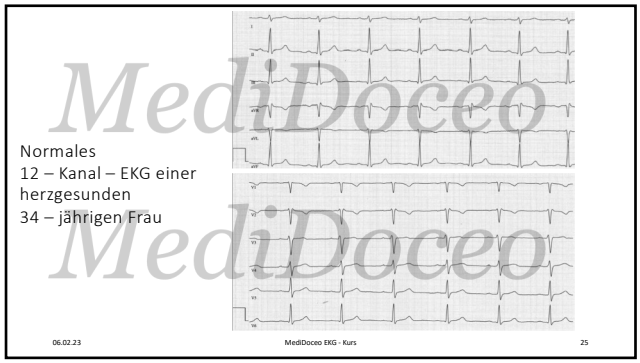
23

QRS - Komplex

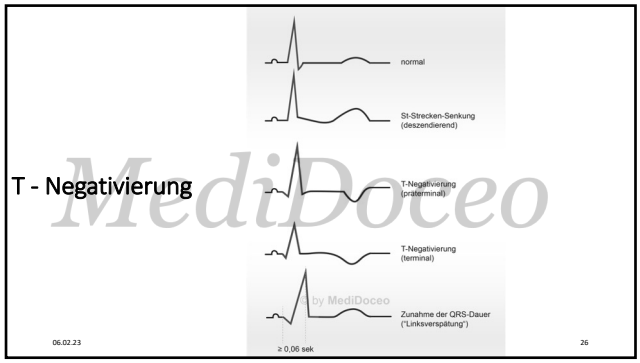



MediDoceo EKG - Kurs 24

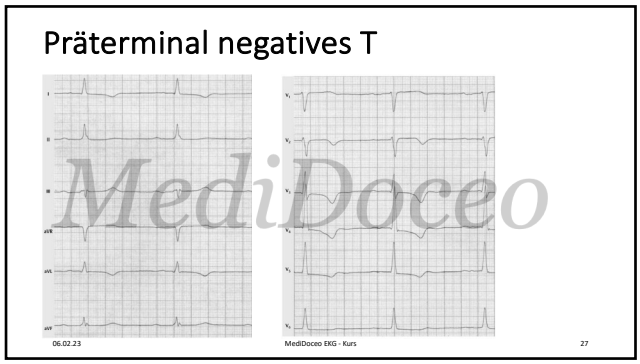
24


Normales
12 – Kanal – EKG einer
herzgesunden
34 – jährigen Frau
MediDoceo
MediDoceo
06.02.23
MediDoceo EKG - Kurs
25

25

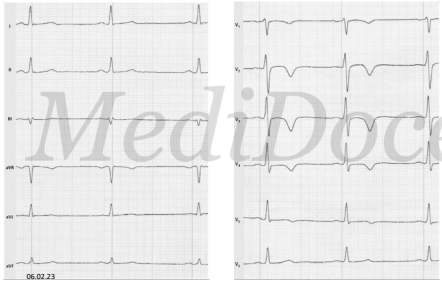

T - Negativierung
normal
St-Strecken-Senkung
(deszendierend)
T-Negativierung
(präterminal)
T-Negativierung
(terminal)
Zunahme der QRS-Dauer
("Linksverspätung")
≥ 0,06 sek
MediDoceo
by MediDoceo
06.02.23
26

26


Präterminal negatives T
MediDoceo
06.02.23
MediDoceo EKG - Kurs
27

27

## Terminal negatives T

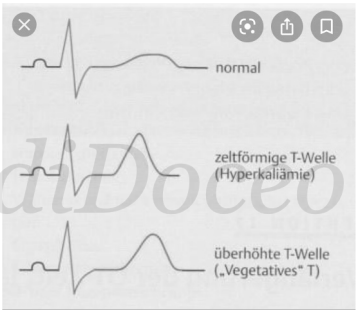


MediDoceo

06.02.23 28

28

## T - Welle



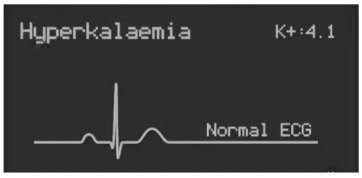

MediDoceo

06.02.23 MediDoceo EKG - Kurs 29

29

## ZeltförmigesT bei Hyperkaliäme

Kaliumspiegel
Und
T-Welle

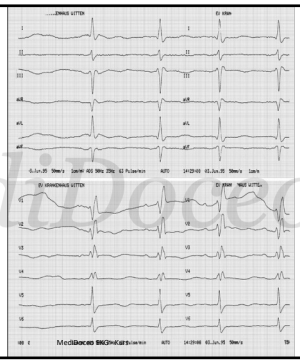



MediDoceo

06.02.23

30

Flache T-Welle
bei
Hypokaliämie

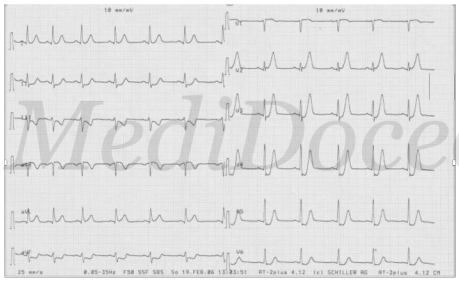


MediDoceo

06.02.23 MediDoceo EKG - Kurs 31

31

## Erstickungs - T

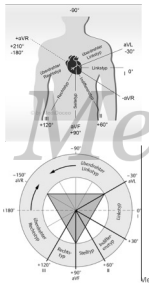


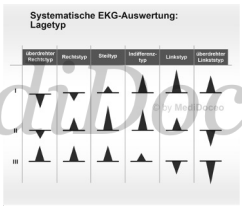
MediDoceo

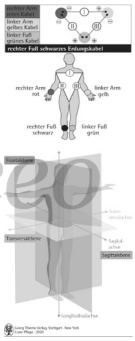
06.02.23 MediDoceo EKG - Kurs 32

32

## Lagetyp – elektrische Herzachse





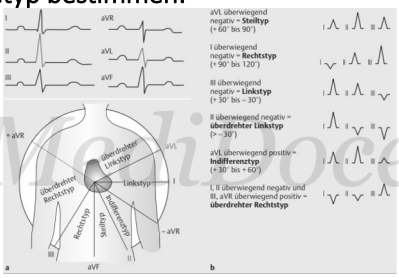




MediDoceo

MediDoceo EKG - Kurs 2/6/23 33

33

## Lagetyp bestimmen:


aVL überwiegend negativ = Steiltyp (+ 60° bis 90°)
I überwiegend negativ = Rechtstyp (+ 90° bis 120°)
III überwiegend negativ = Linkstyp (+ 30° bis – 30°)
II überwiegend negativ = überdrehter Linkstyp (> – 30°)
aVL überwiegend positiv = Indifferenztyp (+ 30° bis + 60°)
I, II überwiegend negativ und III, aVR überwiegend positiv = überdrehter Rechtstyp
überdrehter Linkstyp
überdrehter Rechtstyp
Linkstyp
Indifferenztyp
Rechtstyp
Steiltyp
a
b

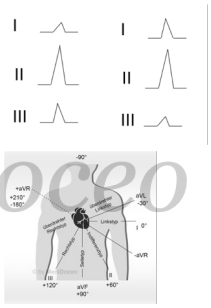
MediDoceo



34

**Steiltyp:**
- I, II, III: positiv
- III > I

**Indifferenztyp / Mitteltyp:**
- I, II, III: positiv
- I > III



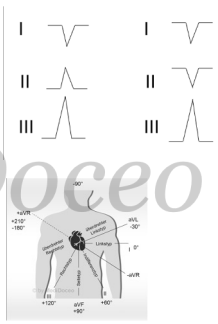

MediDoceo



35

**Rechtstyp**
- I ist negativ
- III ist höher als II

**Überdrehter Rechtstyp**
- I und II sind negativ
- III ist positiv



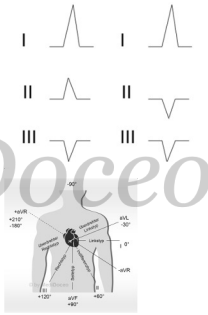

MediDoceo



36

**Linkstyp**
- I und II sind positive
- III ist negativ

**Überdrehter Linkstyp**
- I ist positive
- II und III sind negativ




MediDoceo

06.02.23 MediDoceo EKG - Kurs 37

37

## Lagetyp: Systematik

| Lagetyp | I | II | III |
|---|---|---|---|
| ÜLT | + | - | - |
| LT | + | + | - |
| IT / ST | + | + | + |
| RT | - | + | + |
| ÜRT | - | - | + |

© by MediDoceo

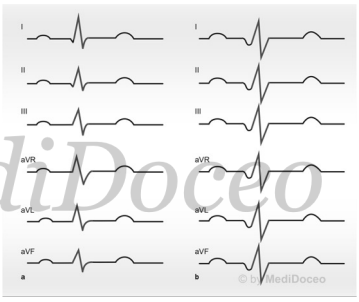
MediDoceo

06.02.23 MediDoceo EKG - Kurs 38

38

**Seltene Ausnahmen:**

**Sagital-Typ**
**SI - SII - SIII - Typ**

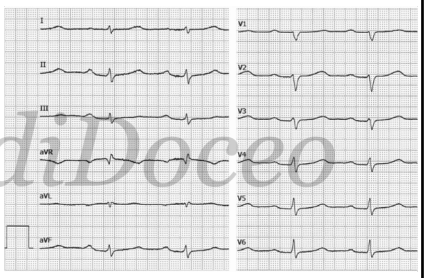



MediDoceo

MediDoceo EKG - Kurs 06.02.23 39

39

**Seltene Sonderform:**
**Sagital-Typ**
**SI - SII - SIII - Typ**

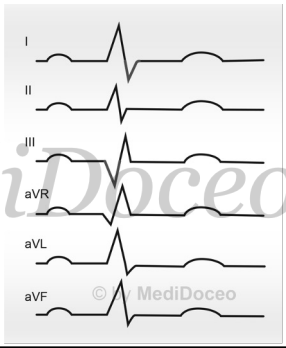



MediDoceo

MediDoceo EKG - Kurs 06.03.23 40

40

Sonderform: SI-QIII-Typ

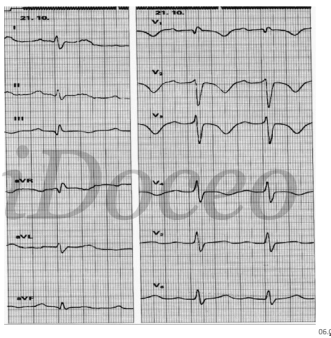



MediDoceo
© by MediDoceo

MediDoceo EKG - Kurs 06.03.23 41

41

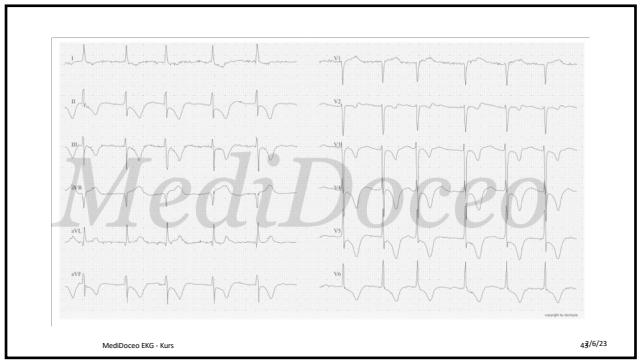
**Sonderform: SI-QIII-Typ**



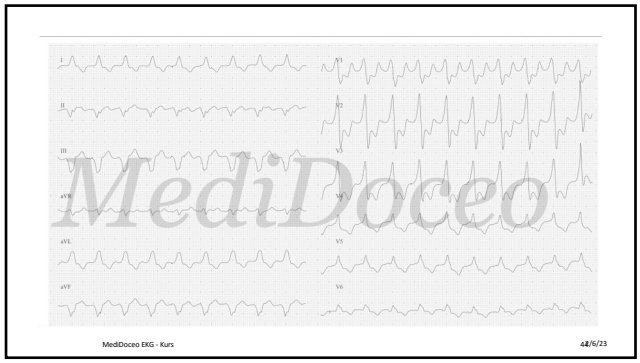
MediDoceo

MediDoceo EKG - Kurs 06.03.23 42

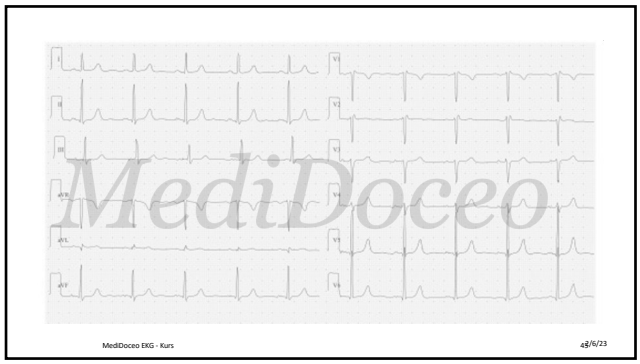
42


MediDoceo
MediDoceo EKG - Kurs
43/6/23

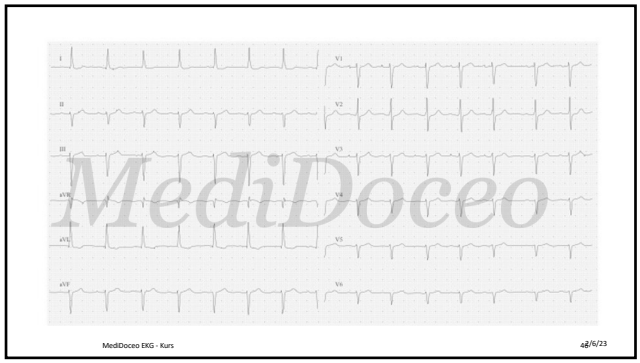
43


MediDoceo
MediDoceo EKG - Kurs
44/6/23

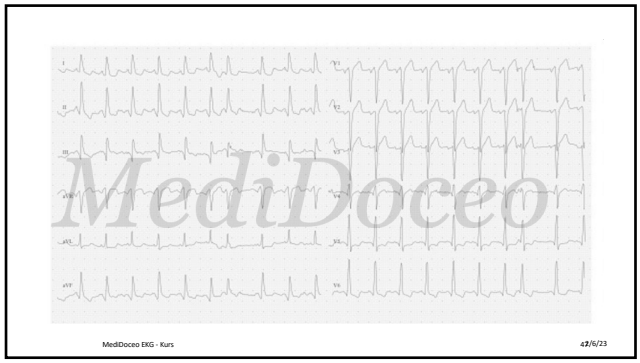
44


MediDoceo
MediDoceo EKG - Kurs
45/6/23

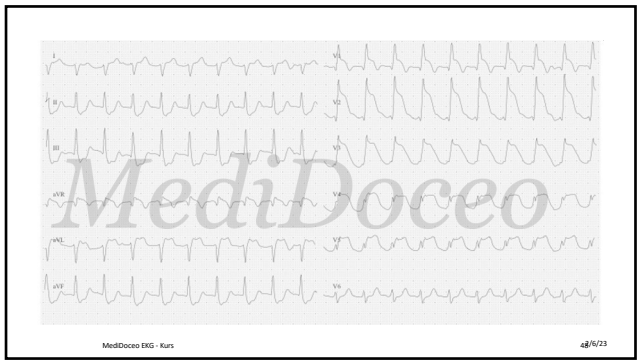
45


MediDoceo
MediDoceo EKG - Kurs
46/6/23

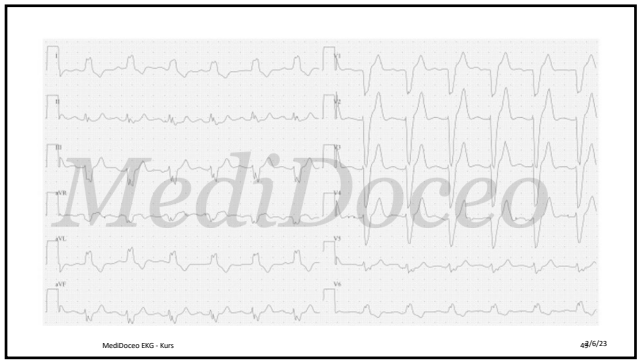
46


MediDoceo
MediDoceo EKG - Kurs
47/6/23

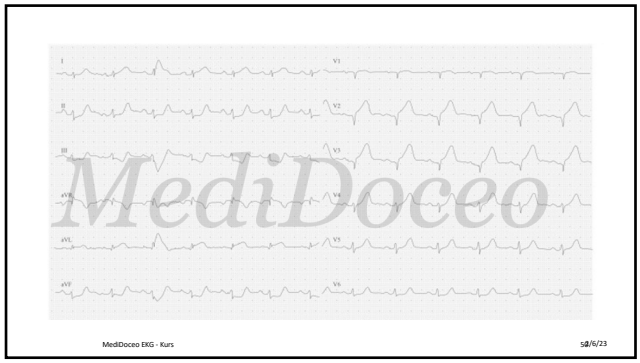
47


MediDoceo
MediDoceo EKG - Kurs
48/6/23

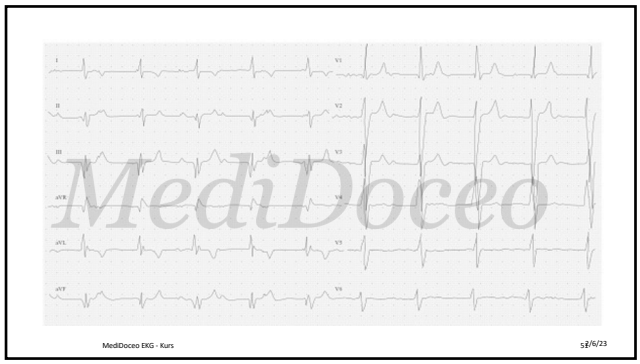
48


MediDoceo
MediDoceo EKG - Kurs
48
9/6/23

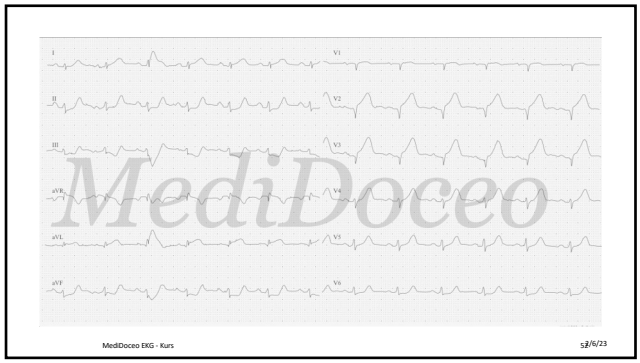
49


MediDoceo
MediDoceo EKG - Kurs
50
9/6/23

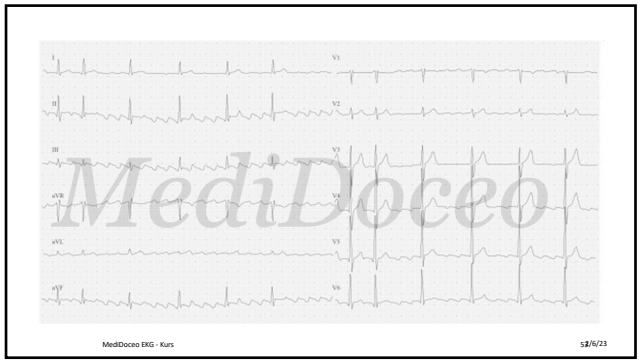
50


MediDoceo
MediDoceo EKG - Kurs
51
9/6/23

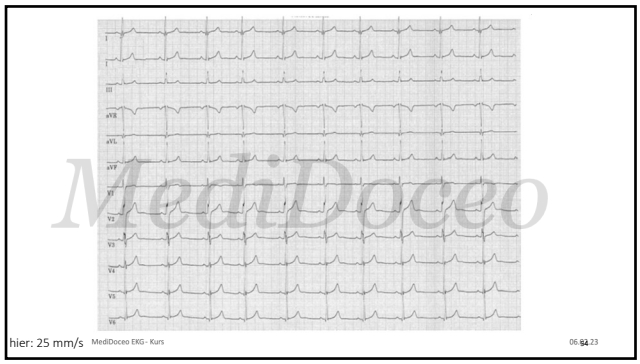
51


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
MediDoceo
MediDoceo EKG - Kurs
52
2/6/23

52


I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
MediDoceo
MediDoceo EKG - Kurs
53
2/6/23

53

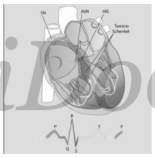

I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
MediDoceo
hier: 25 mm/s
MediDoceo EKG - Kurs
54
06.02.23

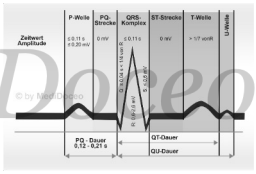
54

Prüfungsfrage

**Zykluslänge**

- Abstand zwischen 2 R – Zacken
- mit EKG – Lineal messen
- ist Abhängig von HF
  - 1000 ms entspricht 60 / min.
  - 2000 ms entspricht 30 / min.
  - 500 ms entspricht 120 / min.
  - 600 ms entspricht 100 / min.



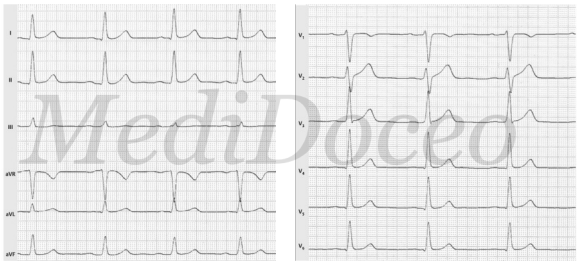



MediDoceo



55

Normaler Sinusrhythmus

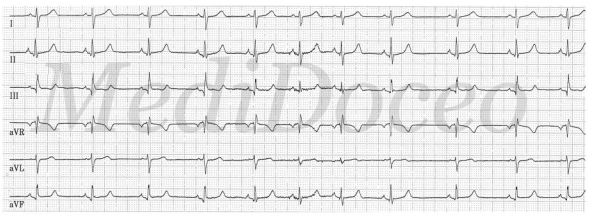



MediDoceo



56

???

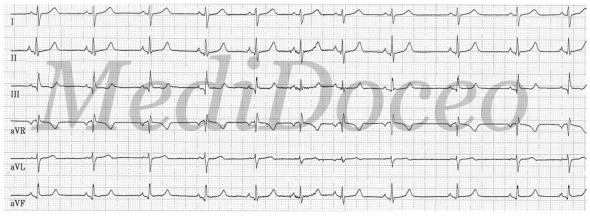



MediDoceo



57

## Sinusarrhythmie

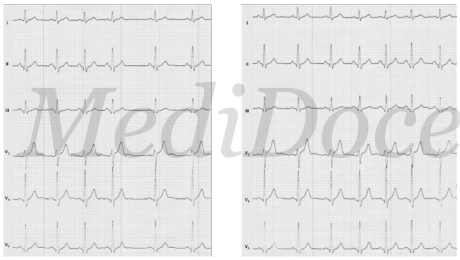



MediDoceo

06.02.23 MediDoceo EKG - Kurs 58

58

## Respiratorische Arrhythmie



MediDoceo

06.02.23 MediDoceo EKG - Kurs 59

59

## Herzfrequenz beim Sinusrhythmus

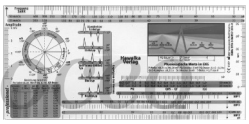
- Herzfrequenz zwischen 60 und 100/Min.: **Normofrequenter Sinusrhythmus**
- Sinusrhythmus von größer 100/Min.: **Sinustachykardie**
- Sinusrhythmus kleiner 60/Min.: **Sinusbradykardie**.

MediDoceo

MediDoceo EKG - Kurs 06.02.23 60

60

## Methoden zur Herzfrequenzbestimmung

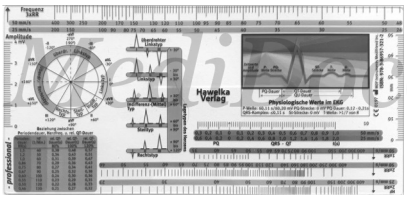




61

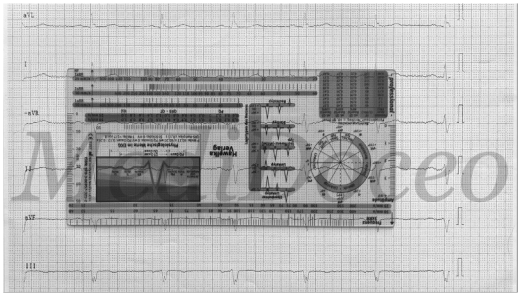
## Ermittlung der Herzfrequenz im 12 - Kanal EKG bei 50 mm/s

**Mit EKG - Lineal**





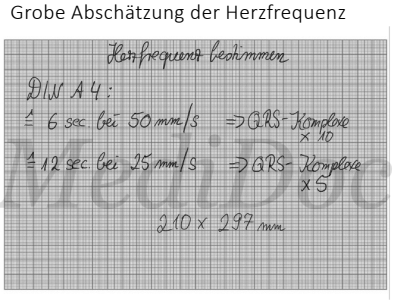
62





63

Grobe Abschätzung der Herzfrequenz



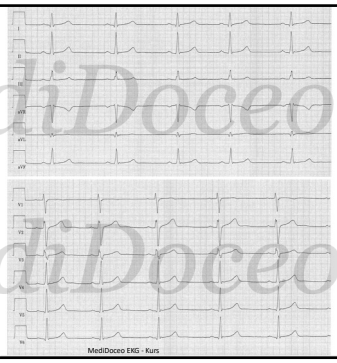

MediDoceo



64

12 – Kanal EKG

50 mm/s



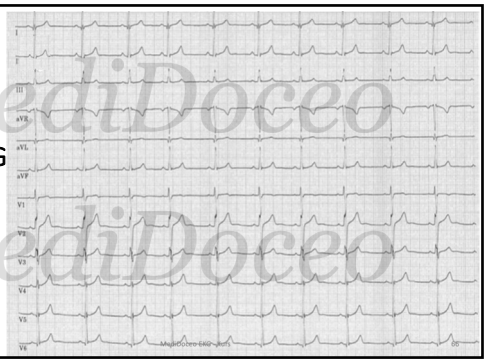
MediDoceo MediDoceo



65

12-Kanal EKG

25 mm/s

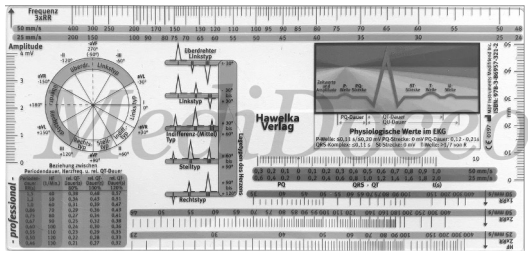


MediDoceo MediDoceo



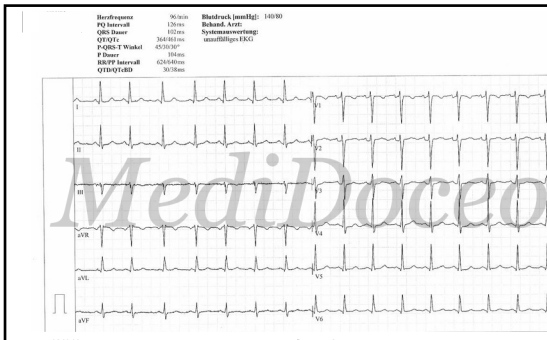
66

## Ermittlung des Lagetyps mit dem EKG - Lineal



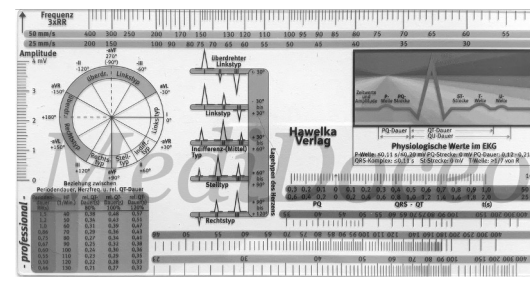



67



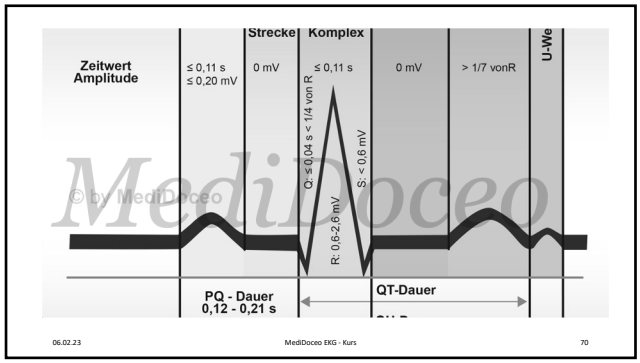



68





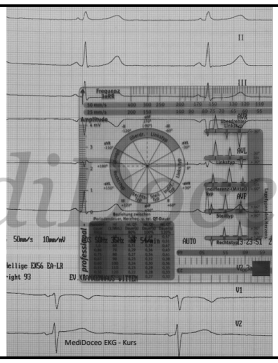

69




70

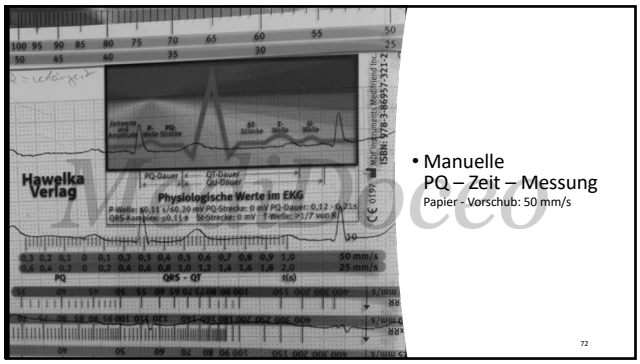
Amplitude der P - Welle mit dem EKG - Lineal ausmessen

SR, normale P-Welle





71




- Manuelle PQ – Zeit – Messung

Papier - Vorschub: 50 mm/s

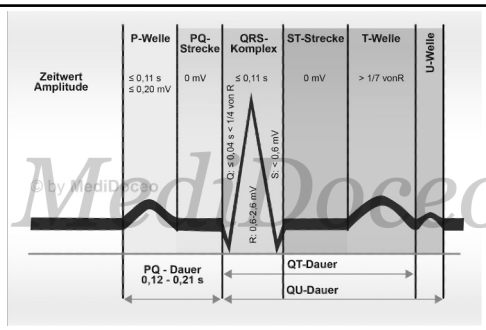
72

## J – Punkt im EKG

MediDoceo



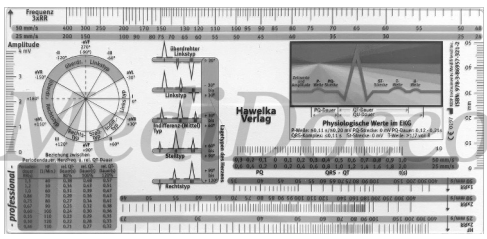
73




© by MediDoceo



74



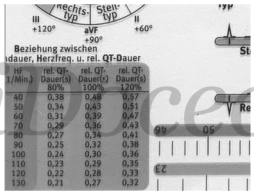

MediDoceo



75

## QT – Zeit

Beziehung zwischen Periodendauer, Herzfrequenz und relativer QT-Zeit - Dauer




MediDoceo



76

## Aktueller Kenntnisstand:

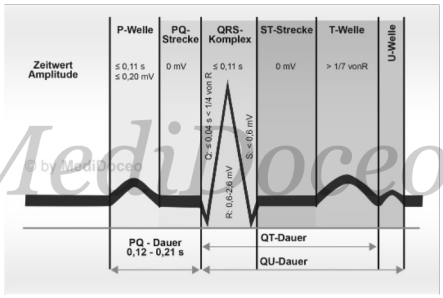
- Erregungsleitungssystem des Herzens
- 12 Ableitungen der EKG –Registrierung
- Bedeutung der Zacken und Wellen & regionale Zuordnung
- Immer im Zusammenhang mit Vitalparameter und Beschwerden auswerten
- Kriterien eines Sinusrhythmus
- Herzfrequenz und Lagetyp – Bestimmung
  - durch manuelle EKG – Ausmessung mit EKG – Lineal
  - mittels Blickdiagnose

➔ Weiter: Ausmessen der ST - Strecke

MediDoceo



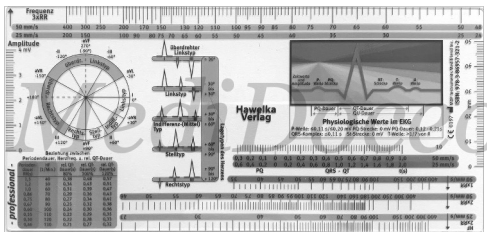
77




MediDoceo
© by MediDoceo



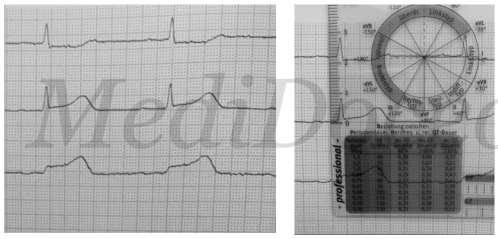
78




06.02.23 MediDoceo EKG - Kurs 79

79

## Ausmessen der ST - Strecke

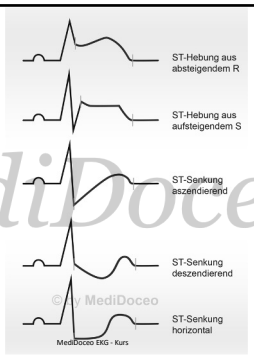


06.02.23 MediDoceo EKG - Kurs 80

80

## ST – Hebungen

## ST - Senkungen

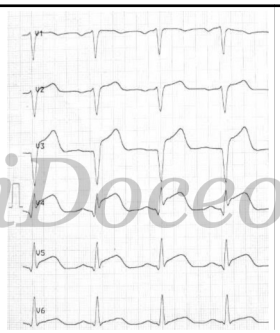



06.02.23 MediDoceo EKG - Kurs 81

81

ST – Hebung
bei frischem Infarkt

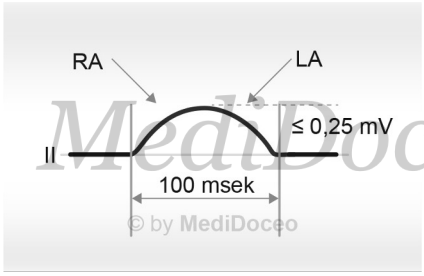
→ „aus der R-Zacke“



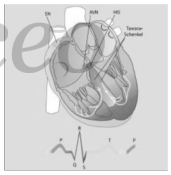

MediDoceo

06.02.23 MediDoceo EKG - Kurs 82

82



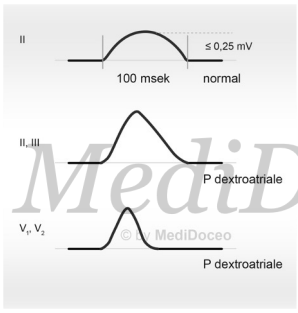

Normale
P-Welle



MediDoceo

06.02.23 MediDoceo EKG - Kurs 83

83



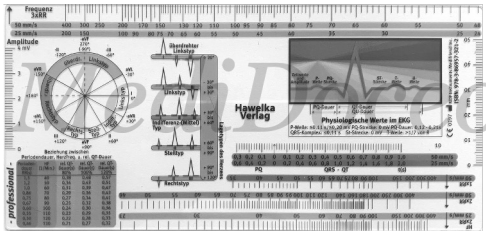

P-Pulmonale
oder
P-dextroatriale
überhöht

MediDoceo

06.02.23 MediDoceo EKG - Kurs 84

84

P – Welle ausmessen:
P – Verbreiterung & P - Überhöhung




06.02.23 MediDoceo EKG - Kurs 85

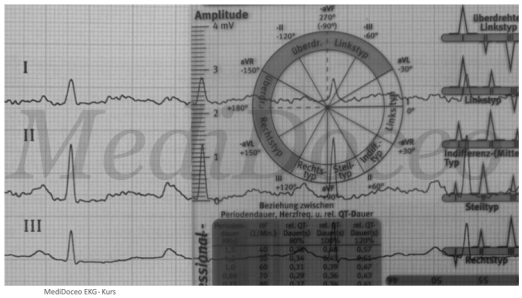
85

P- Pulmonale → hohe Amplitude

MediDoceo EKG - Kurs 2/6/23 86

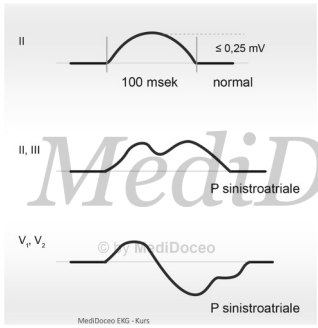
86

P- Pulmonale <u>hohe</u> Amplitude




MediDoceo EKG - Kurs 2/6/23 87

87




P-sinistroatriale
P-mitrale

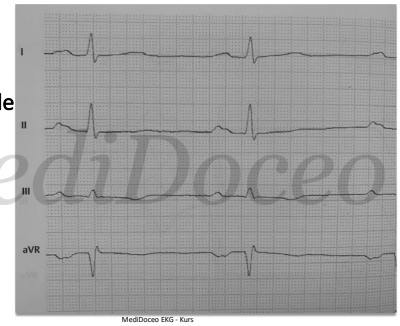
- verbreitert -

MediDoceo

88

P – mitrale =
P - sinistroatriale

**Verbreiterte**
P-Welle

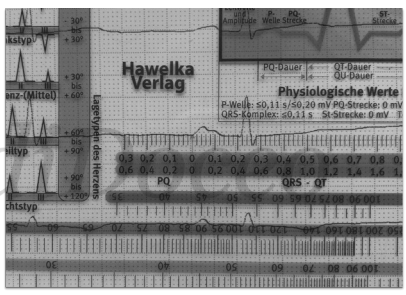



MediDoceo

89

P – mitrale
P - sinistroatriale

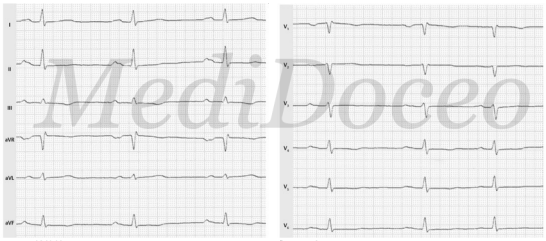
P – Welle ist **verbreitert** und auf 0,14 Sekunden **verlängert**
(mit Kerbung)




MediDoceo

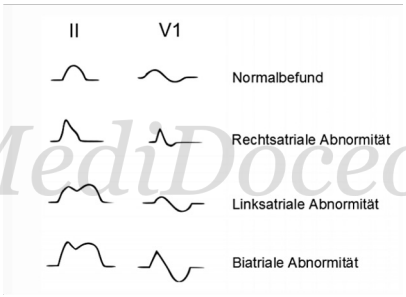
90

## Blickdiagnose: P - sinistroatriale



06.02.23 MediDoceo EKG - Kurs 91

91




MediDoceo EKG - Kurs 92/6/23

92

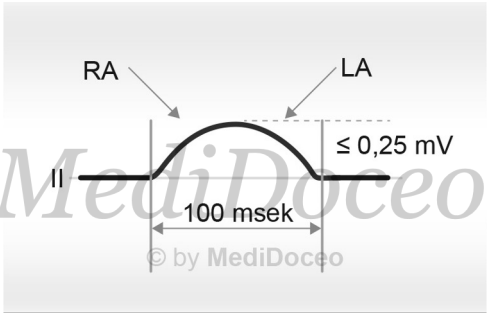
## P - biatriale

➔

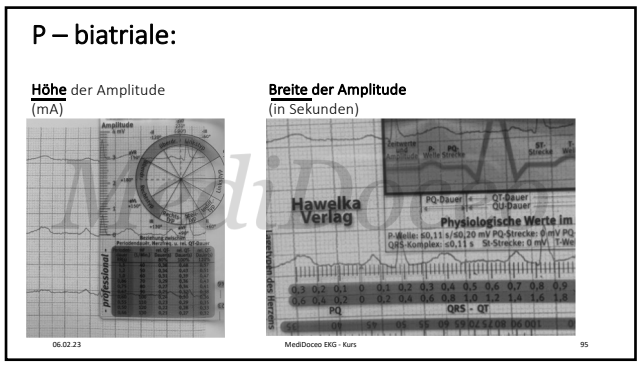
**überhöhte** und **verbreiterte** P-Welle

MediDoceo EKG - Kurs

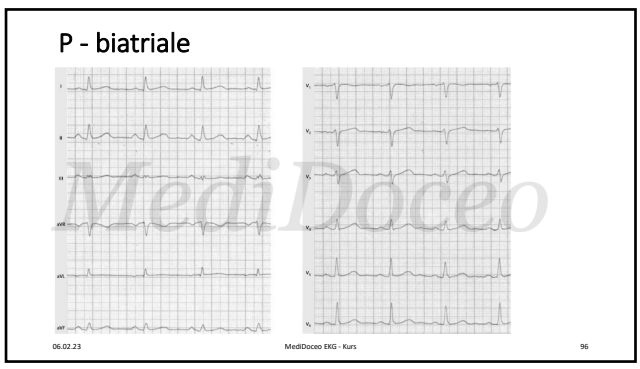
93


RA
LA
≤ 0,25 mV
II
100 msek
MediDoceo
© by MediDoceo
06.02.23
MediDoceo EKG - Kurs
94

94

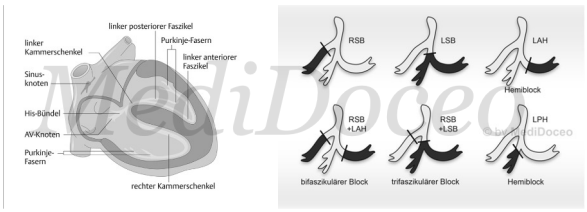

P – biatriale:
Höhe der Amplitude
(mA)
Breite der Amplitude
(in Sekunden)
Hawelka Verlag
Physiologische Werte im
PQ
QRS - QT
06.02.23
MediDoceo EKG - Kurs
95

95


P - biatriale
MediDoceo
06.02.23
MediDoceo EKG - Kurs
96

96

## Intraventrikuläre Reizleitungssystem des Herzens Blockbilder

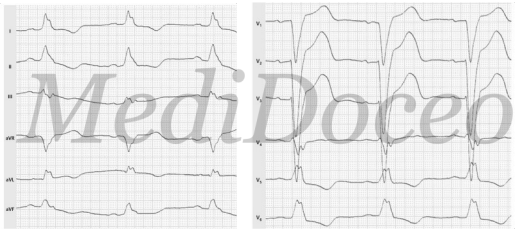



MediDoceo

MediDoceo EKG - Kurs 06.02.23 97

97

## Beschreiben Sie das Blockbild!



MediDoceo

06.02.23 MediDoceo EKG - Kurs 98

98

- Endgültige Negativitätsbewegung
- OUP
- Terminale Negativitätsbewegung

• Immer den OUP in V1 und V6 vergleichen!
• Wo ist der OUP verspätet?

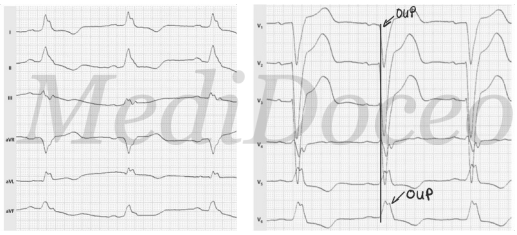
MediDoceo

  • In V1→ RSB
  • In V6 → LSB

06.02.23 MediDoceo EKG - Kurs 99

99

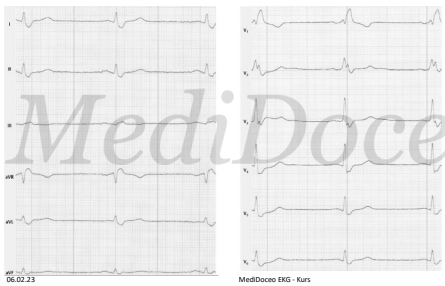
OUP ist in V6 verspätet → LSB




06.02.23 MediDoceo EKG - Kurs 100

100

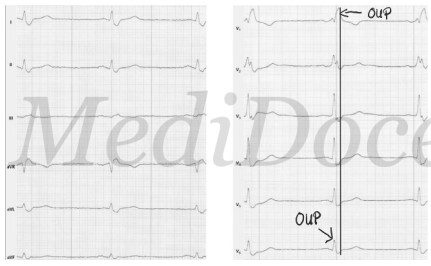
Welches Blockbild liegt vor?



06.02.23 MediDoceo EKG - Kurs 101

101

OUP ist in V1 verspätet → RSB

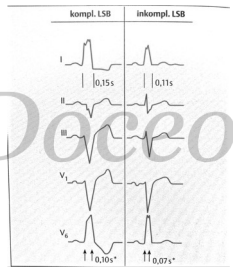



06.02.23 MediDoceo EKG - Kurs 102

102

## Kompletter und inkompletter Block

- Im Schenkelblock-EKG sind die QRS-Komplexe deformiert und verbreitert.
- Ist der QRS-Komplex kleiner als 0,12 s dann → inkompletter Schenkelblock.
- Ist der QRS-Komplex gleich oder breiter als 0,12s → kompletter Schenkelblock vor.
- Man misst die QRS-Breite und die endgültige Negativitätsbewegung sinnvollerweise in V1 und V6.




MediDoceo

06.02.23 MediDoceo EKG - Kurs 103

103

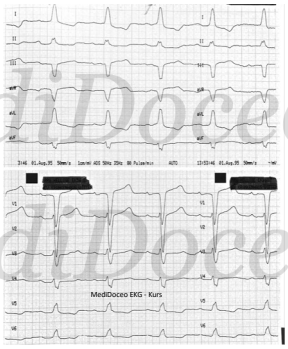
## Diagnosekriterien kompletter LSB

MediDoceo

06.02.23 MediDoceo EKG - Kurs 104

104

Welches Blockbild
→ Hinweis: QRS < 0,12 s

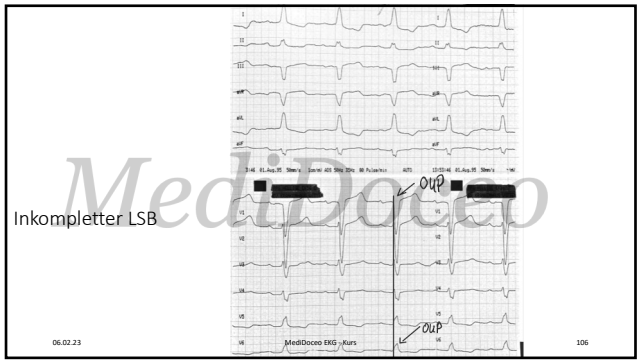


MediDoceo
MediDoceo

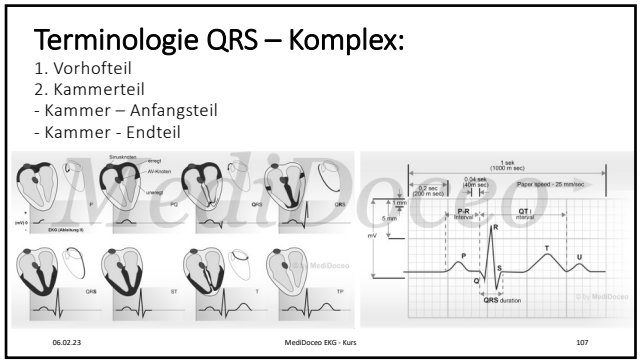
MediDoceo EKG - Kurs

06.02.23 105

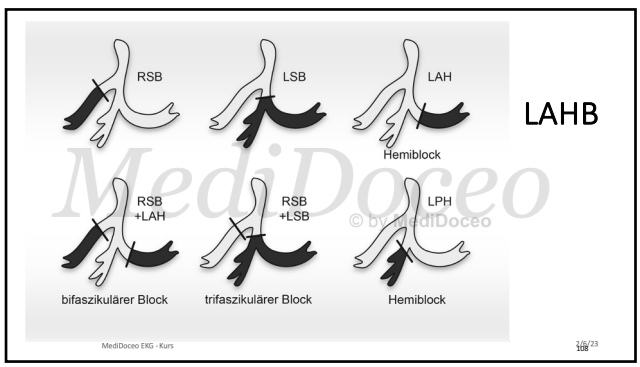
105


Inkompletter LSB
oup
oup
06.02.23
MediDoceo EKG - Kurs
106

106

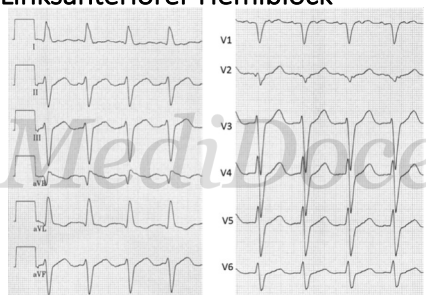

Terminologie QRS – Komplex:
1. Vorhofteil
2. Kammerteil
- Kammer – Anfangsteil
- Kammer - Endteil
Paper speed - 25 mm/sec
P-R interval
QT interval
QRS duration
06.02.23
MediDoceo EKG - Kurs
107

107


RSB
LSB
LAH
Hemiblock
LAHB
RSB +LAH
RSB +LSB
LPH
bifaszikulärer Block
trifaszikulärer Block
Hemiblock
MediDoceo EKG - Kurs
108

108

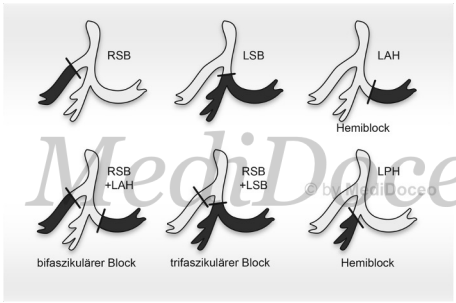
## Linksanteriorer Hemiblock




MediDoceo

06.02.23 MediDoceo EKG - Kurs 109

109

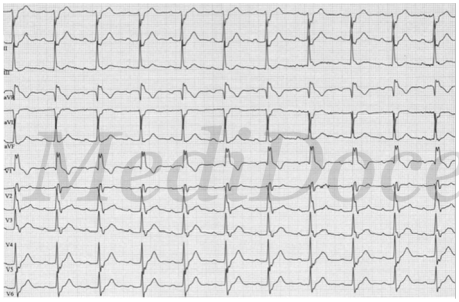



LPB

MediDoceo

06.02.23 MediDoceo EKG - Kurs 110

110



## LPHB

Rechtsabweichung der QRS –Achse

Rechtsverlagerung des RS –Umschlag

rS in I + aVL

qR in III und aVF

MediDoceo

MediDoceo EKG - Kurs 2/6/23 111

111

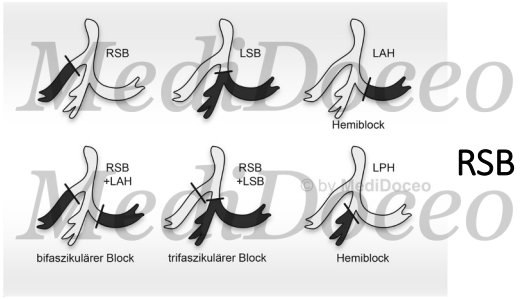
**LAHB (häufig)**
- ÜLT
- Tiefes S bis V6

**LPHB (selten)**
- Rechtstyp oder überdrehter Rechtstyp
- rS in I + aVL
- qR in III und aVF

MediDoceo

06.02.23 MediDoceo EKG - Kurs 112

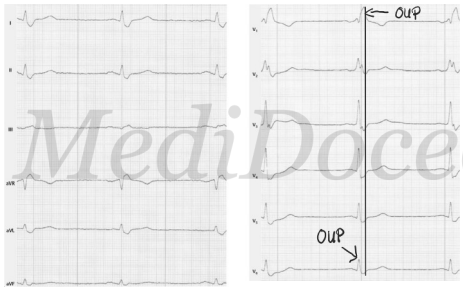
112




MediDoceo EKG - Kurs 113

113

OUP ist in V1 verspätet → RSB



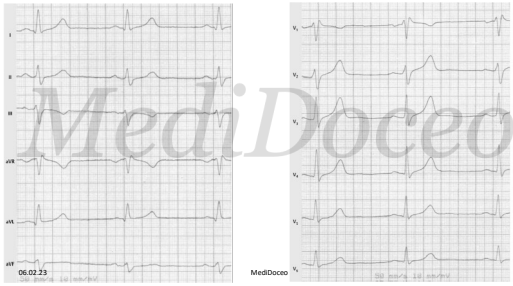

06.02.23 MediDoceo EKG - Kurs 114

114

## Kompletter Rechtschenkelblock

115

## Inkompletter Rechtschenkelblock





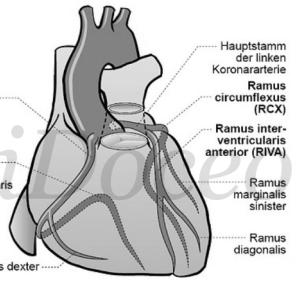
116

**Wichtig zu wissen:**

Anatomie

Infarktstadien

Infarkt - Lokalisationsdiagnostik



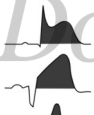



117

## Definition STEMI:

- **Signifikante** ST-Hebungen in mindestens 2 benachbarten Ableitungen

- dies muss am J-Punkt gemessen warden (= Übergang S-Zacke zur ST-Strecke)



**ST-Hebung über 1mm** am J-Punkt in zwei zusammenhängenden Ableitungen

Signifikant bedeutet:

→ in allen Ableitungen ≥ 1mm

→ in Brustwandableitungen V2-3:
≥ 2,5 mm bei Männern <40 Jahren,
≥ 2mm bei Männern ≥40 Jahren
≥ 1,5mm bei Frauen



ST-Hebung am J Punkt in V2/3
>2,5mm bei Männern bis 40J
>2mm bei Männern ab 40J
>1,5mm bei Frauen



Hebungen in V7-9 oder RV Ableitungen

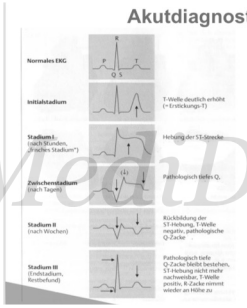
→ inV7-9: 0,5mm am J-Punkt



118

## STEMI

### Akutdiagnostik: EKG




**normal**

**T nur in ersten Minuten**

**Klassische ST-Hebung für myokardiale Ischämie (ST-Hebung aus R heraus!)**

**Q-Zacke ist Nekrosezeichen (nach Stunden)**

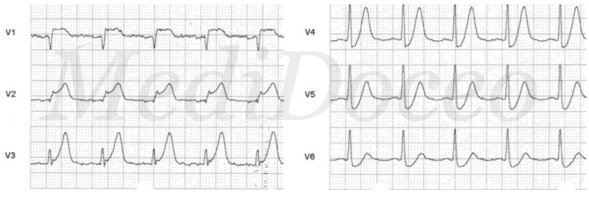
**Folge R-Verlust und persistierende Q-Zacke**



119

## Akuter Vorderwandinfarkt

Erstickungs-T in V3 und V4
Regelrechte ST Hebung in V1 und V2



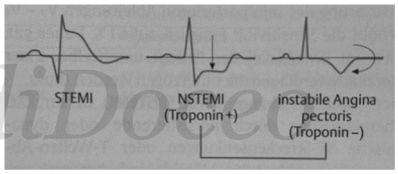



120

## NSTEMI

**Vor der Ischämie:**
- Normales EKG

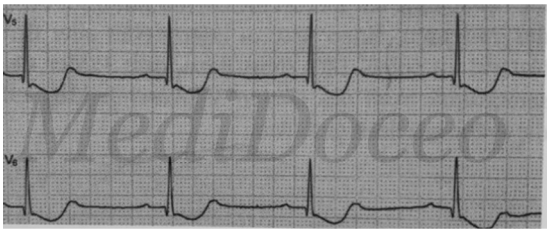
**Während der Ischämie:**
- Keine ST – Hebung
- Herzenzyme erhöht
- signifikante horizontale oder deszendierende ST-Streckensenkungen
- ggf. T-Inversionen




**Chronisches Stadium:**
- Normalisierung der ST – Strecke, ggf. persistierende T – Negativierung

MediDoceo

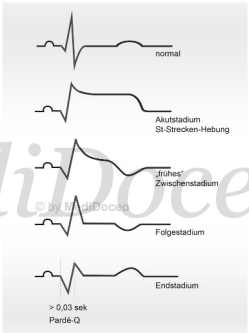

121




MediDoceo


122

## STEMI
## ST – Elevations-Infarkt
Stadieneinteilung




MediDoceo
© by MediDoceo


123

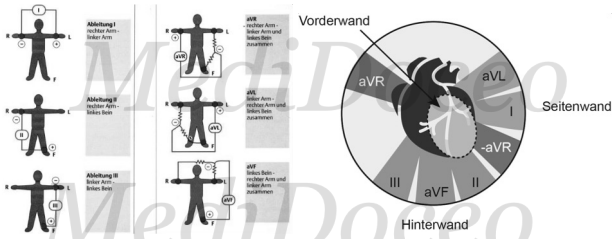
## Infarktlokalisation

- Infarktlokalisation bzw. die betroffene Koronararterie kann durch Infarktzeichen in bestimmten EKG -Ableitungen zugeordnet werden
- Die Lokalisationsbestimmung ist nicht komplett zuverlässig, gibt aber erste Hinweise

MediDoceo



124

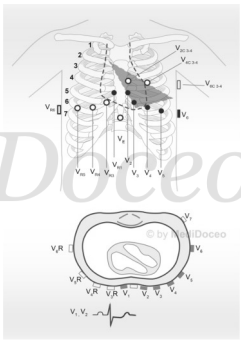



## Lokalisation in der Frontalebene



125

## Lokalisation in der Horizontalebene

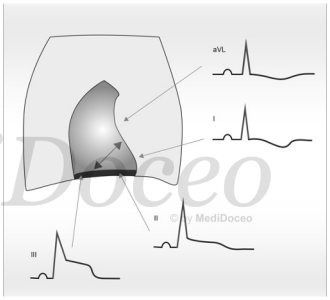




126

1. **Direkte Infarktzeichen**
→**ST – Hebung** in Ableitung über der anatomischen Region

2. **Indirekte Infarktzeichen**
→**ST – Senkungen** in den anatomisch **gegenüberliegenden** Ableitungen
→= reziproke ST – Veränderung



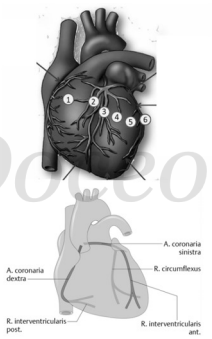

MediDoceo



127

## Vorderwandinfarkt:
zeigt sich in den Ableitungen
I, aVL & V1 – V6
Ursache:
Verschluss des Ramus interventrikuläris anterior (RIVA) aus der linken Koronararterie

## Hinterwandinfarkt:
zeigt sich in den Ableitungen
II, III & aVF
Ursache:
Verschluss des Ramus circumflexus (RCX) oder der rechten Koronararterie (RCA)




MediDoceo

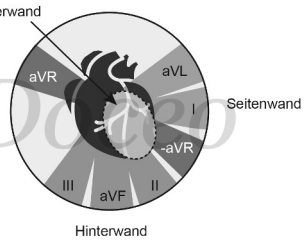


128

## Lokalisationsdiagnostik bei STEMI

**Vorderwandinfarkt** (anatomisch: Seitenwand)
→ RIVA:
→ I, aVL, V1- V6

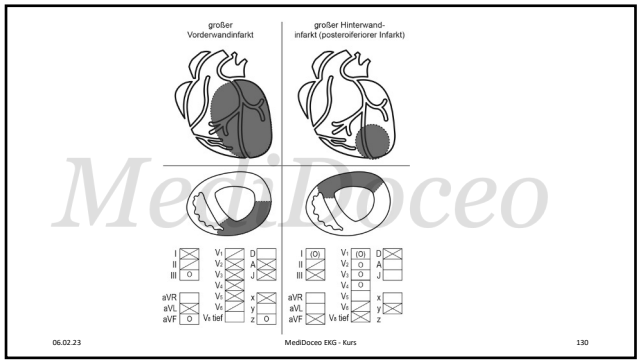
**Hinterwand** (anatomisch: unten)
→RCA oder RCX:
→II, III, aVF



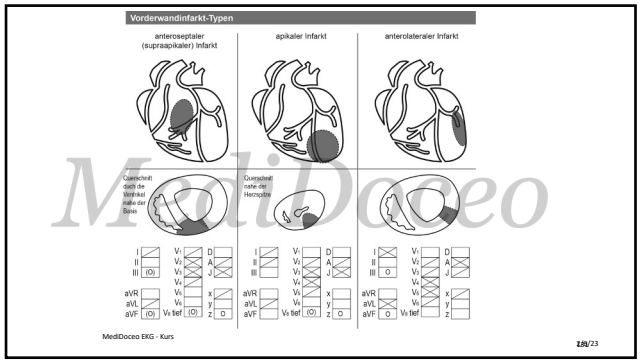

MediDoceo



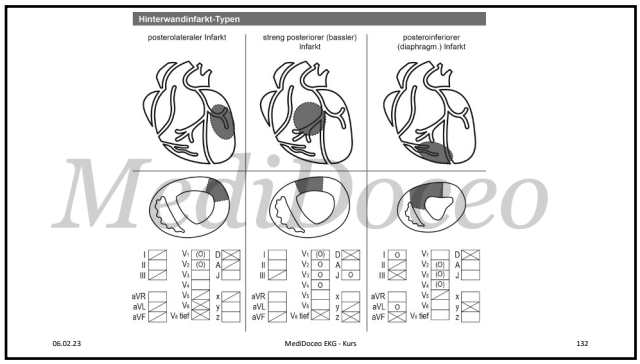
129


großer Vorderwandinfarkt
großer Hinterwand-infarkt (posteroiferiorer Infarkt)
MediDoceo
06.02.23
MediDoceo EKG - Kurs
130

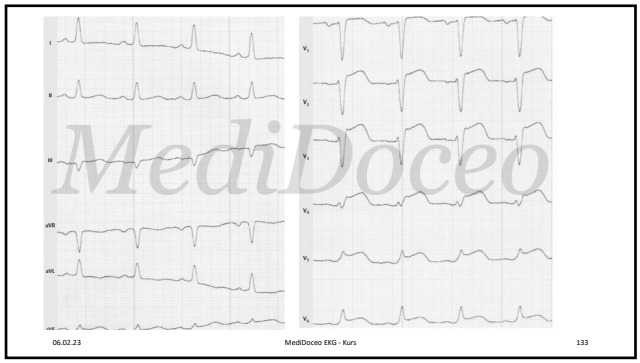
130


Vorderwandinfarkt-Typen
anteroseptaler (supraapikaler) Infarkt
apikaler Infarkt
anterolateraler Infarkt
MediDoceo
MediDoceo EKG - Kurs

131


Hinterwandinfarkt-Typen
posterolateraler Infarkt
streng posteriorer (bassler) Infarkt
posteroinferiorer (diaphragm.) Infarkt
MediDoceo
06.02.23
MediDoceo EKG - Kurs
132

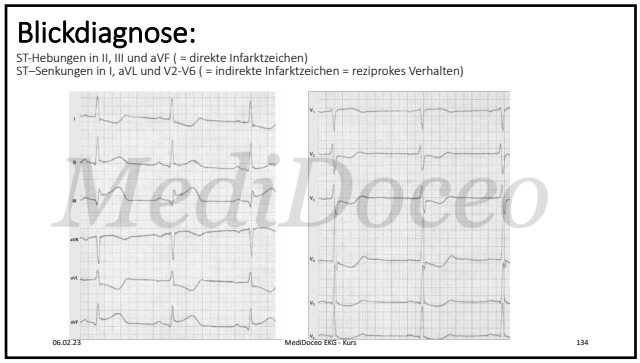
132




133

## Blickdiagnose:

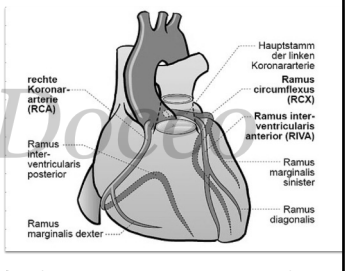
ST-Hebungen in II, III und aVF ( = direkte Infarktzeichen)
ST–Senkungen in I, aVL und V2-V6 ( = indirekte Infarktzeichen = reziprokes Verhalten)




134

## Lokalisationsdiagnostik bei STEMI

- **RIVA:** großer Vorderwandnfarkt:
  Hebung in **I, aVL und V1 – V6**
- **RCA:** inferiorer Hinterwandinfarkt:
  Hebung in **II, II, aVF und V6**
- **Ramus diagonalis (aus RIVA):**
  Anterolateralinfarkt:
  Hebung in **I, aVL, V5 – V7**



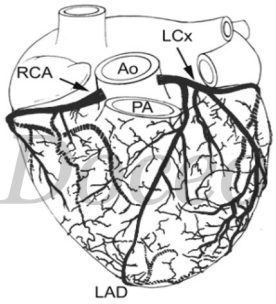

MediDoceo

06.02.23 MediDoceo EKG - Kurs 135

135

## Hauptstamm - Stenose

Koronararterien - Hauptstamm



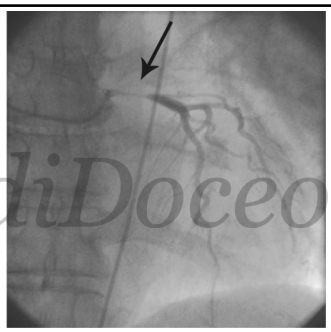

MediDoceo

06.02.23 MediDoceo EKG - Kurs 136

136

## Hauptstamm-Stenose

➔ Koronarangiografie

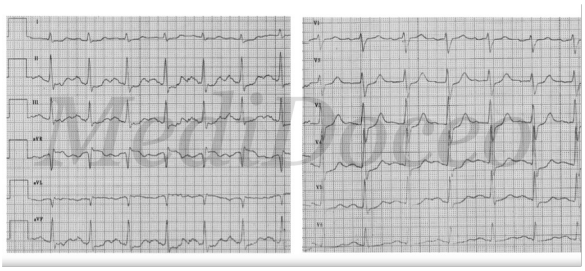


MediDoceo

06.02.23 MediDoceo EKG - Kurs 137

137

## Hauptstammstenose

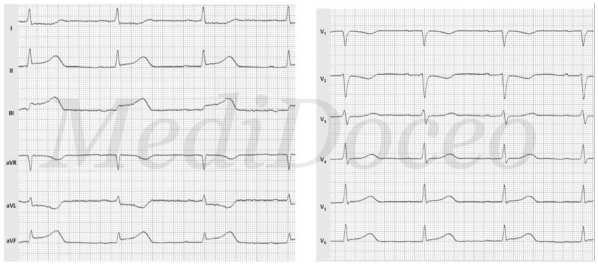


MediDoceo

06.02.23 MediDoceo EKG - Kurs 138

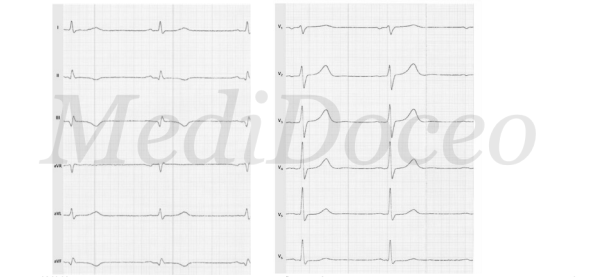
138

Blickdiagnose:

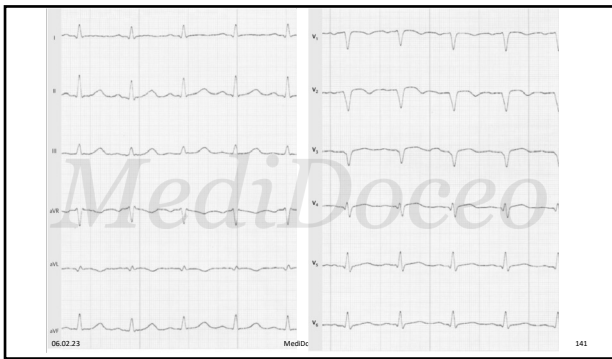



139

Blickdiagnose

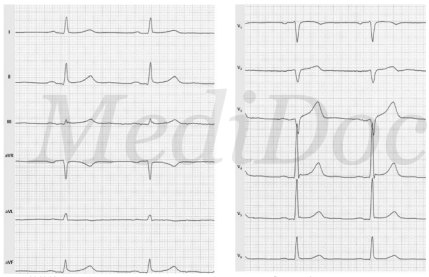



140




141

## Blickdiagnose



**QS-Komplex**

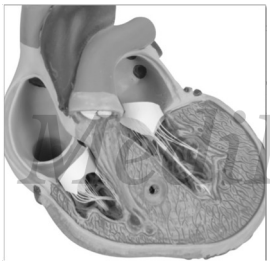
Warum handelt es sich bei einem QS-Komplex?

Findest du im QRS-Komplex nur einen negativen Ausschlag und kannst keinen positiven Ausschlag ausmachen, so sprichtman von QS-Komplex. Dieser ist in der Ableitung v1 physiologisch.

MediDoceo



142



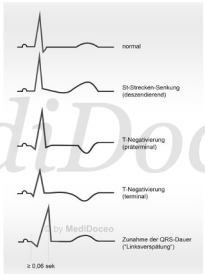
## Linksherzhypertrophie

MediDoceo



143

## Schema Linksherzhypertrophie

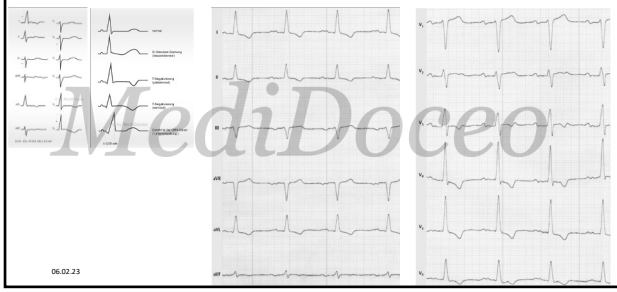


MediDoceo



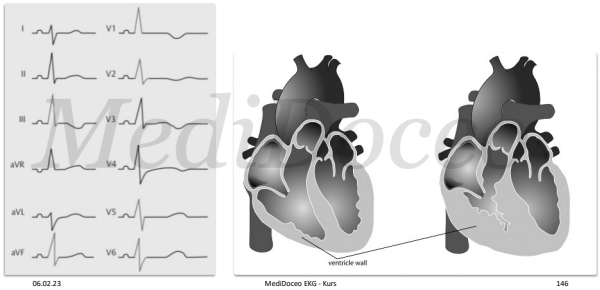
144

## Linksherzhypertrophie - EKG




145

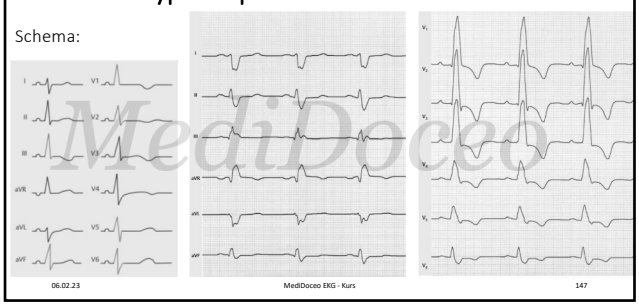
## Rechtsherzhypertrophie



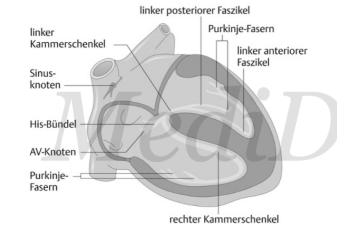

146

## Rechtsherzhypertrophie

Schema:




147




Reizleitungssystem des Herzens

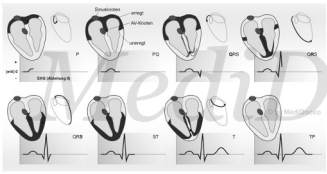
AV-Überleitungsstörungen

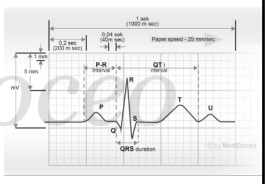
MediDoceo



148

## Elektrische Erregung und AV - Überleitung






MediDoceo



149

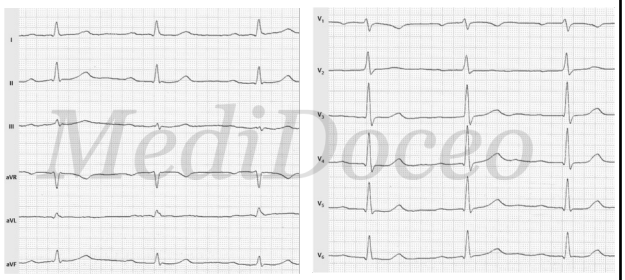
## AV – Block Grad I. Grades

MediDoceo



150

## AV – Block I. Grades



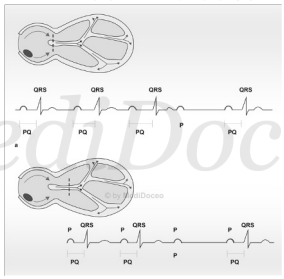
06.02.23 MediDoceo EKG - Kurs 151

151

## AV – Block II. Grades

Typ Wenckebach

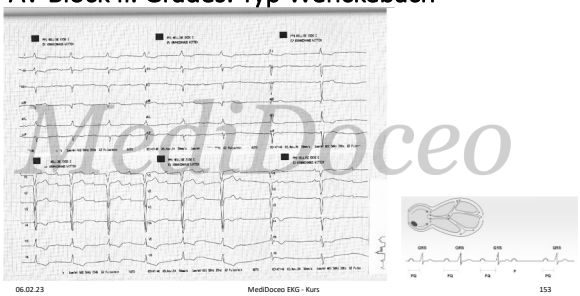
Typ Mobitz




06.02.23 MediDoceo EKG - Kurs 152

152

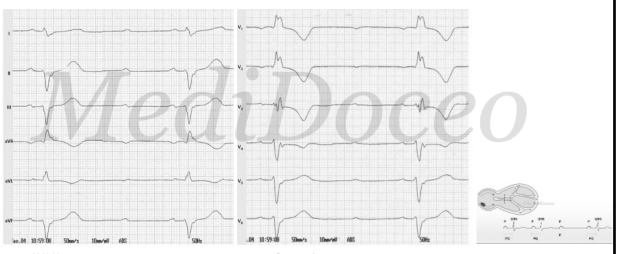
## AV-Block II. Grades: Typ Wenckebach



06.02.23 MediDoceo EKG - Kurs 153

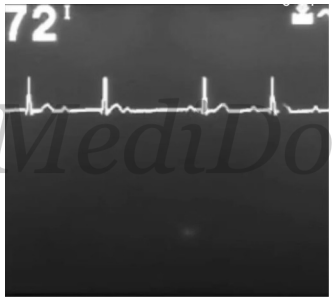
153

## AV – Block II. Grades – Typ Mobitz

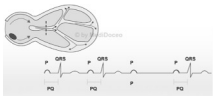


06.02.23 MediDoceo EKG - Kurs 154

154

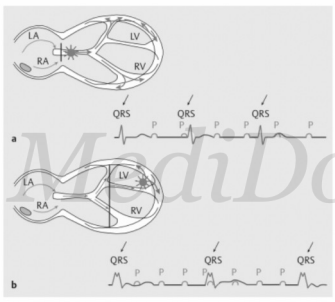


## AV – Block II. Grades



06.02.23 MediDoceo EKG - Kurs 155

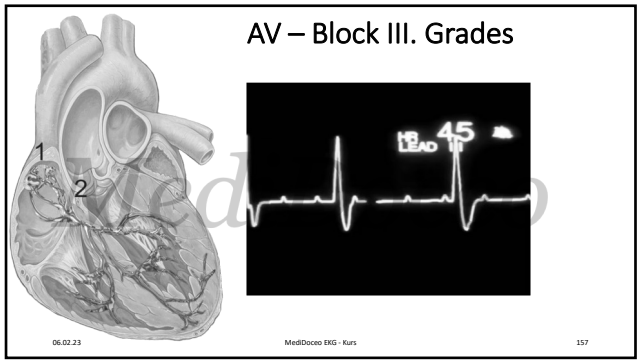
155



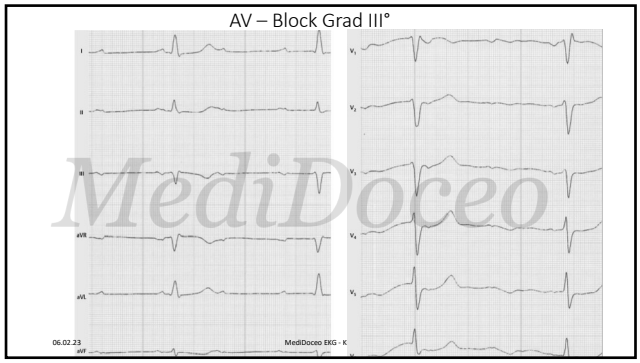

## AV – Block III. Grades

MediDoceo EKG - Kurs 156

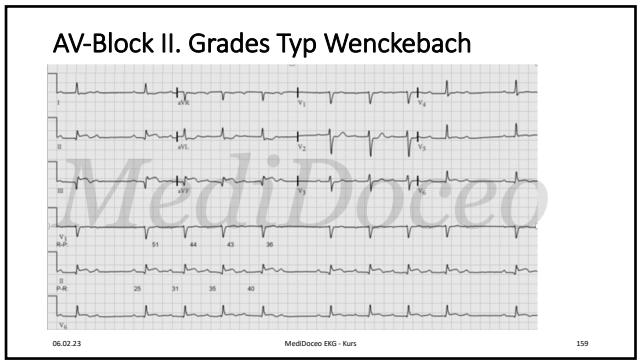
156


AV – Block III. Grades
1
2
LEAD II
45
06.02.23
MediDoceo EKG - Kurs
157

157

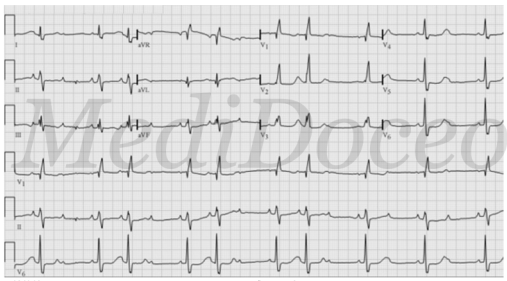

AV – Block Grad III°
I
II
III
aVR
aVL
aVF
V1
V2
V3
V4
V5
V6
06.02.23
MediDoceo EKG - K

158


AV-Block II. Grades Typ Wenckebach
06.02.23
MediDoceo EKG - Kurs
159

159

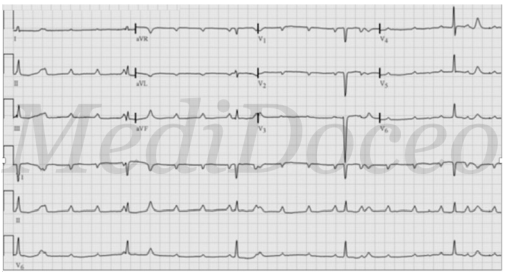
## AV-Block II. Grades Typ Mobitz





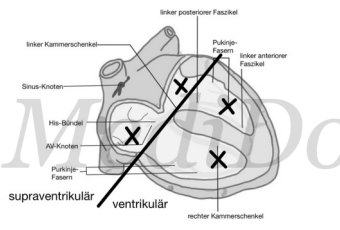
160

## AV– Block III. Grades





161

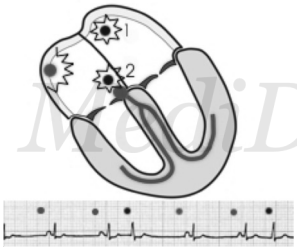



## Extrasystolen



162

## systolen




Mögliche Ursprünge:

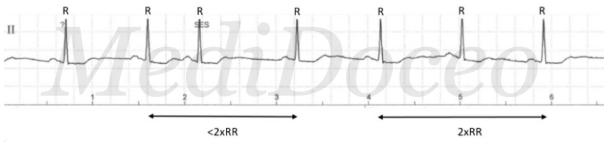
1. Vorhofmyokard (atrial)
2. AV-Knoten (AV–junktional)

MediDoceo



163

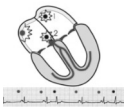
## Atriale Extrasystole




MediDoceo



164



## Atriale Extrasysytole

MediDoceo



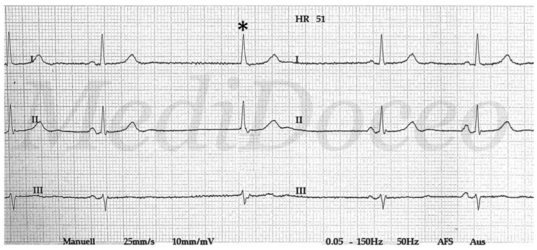
165

Nodale = AV- junktionale SVES

06.02.23 MediDoceo EKG - Kurs 166

166

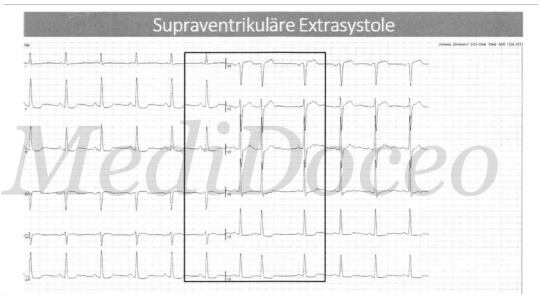
Junktionale Extrasystole




06.02.23 MediDoceo EKG - Kurs 167

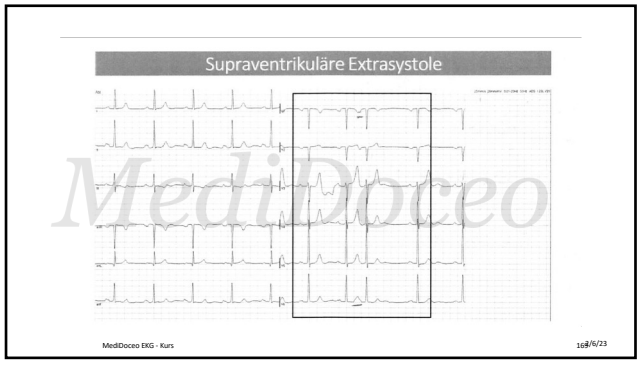
167

Supraventrikuläre Extrasystole

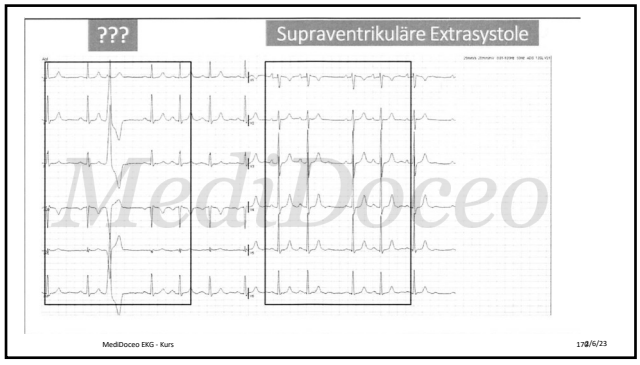


MediDoceo EKG - Kurs 168 2/6/23

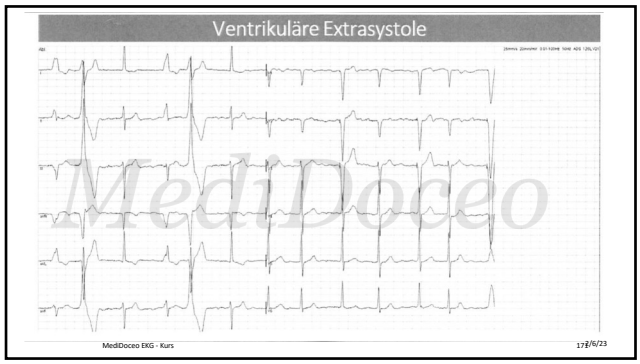
168


Supraventrikuläre Extrasystole
MediDoceo
MediDoceo EKG - Kurs
169
8/6/23

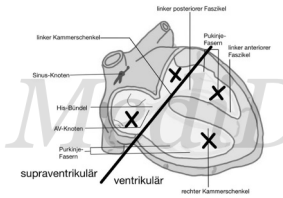
169


???
Supraventrikuläre Extrasystole
MediDoceo
MediDoceo EKG - Kurs
170
8/6/23

170


Ventrikuläre Extrasystole
MediDoceo
MediDoceo EKG - Kurs
171
8/6/23

171




## Ventrikuläre Extrasystolen

Mögliche Ursprünge:

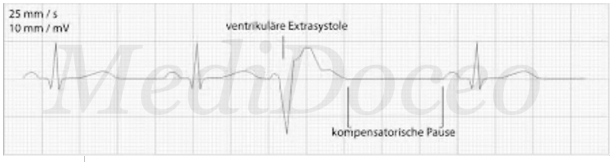
- rechter Ventrikel
- linker Ventrikel

MediDoceo

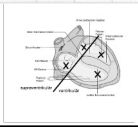
MediDoceo EKG - Kurs 2/6/23 172

172

## Morphologie der VES

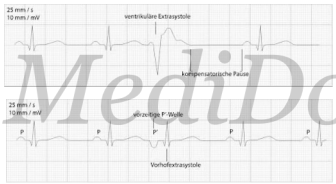



MediDoceo



06.02.23 MediDoceo EKG - Kurs 173

173




## Vergleich VES und SVES

MediDoceo

06.02.23 MediDoceo EKG - Kurs 174

174

VES - Analyse

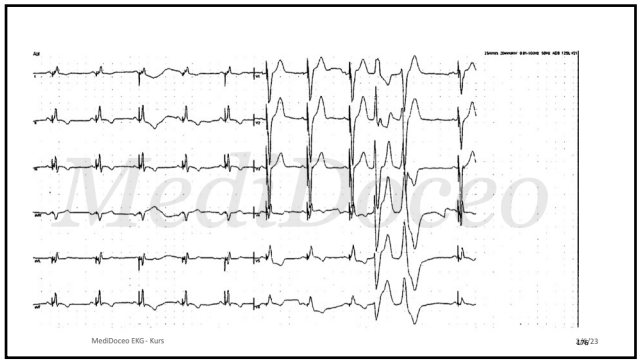
Immer Morphologie und Lagetyp der VES bestimmen

LSB und Steiltyp: prognostisch gutartig!

MediDoceo

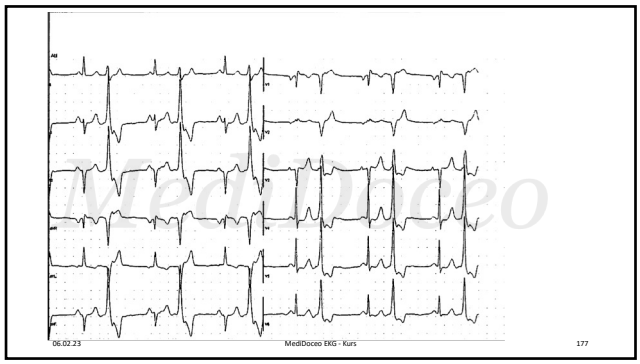
06.02.23 MediDoceo EKG - Kurs 175

175



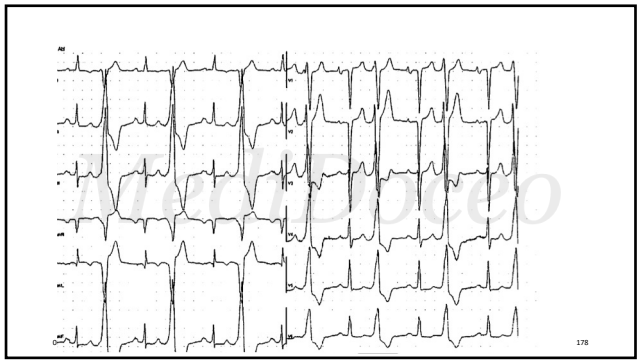

MediDoceo EKG - Kurs

176



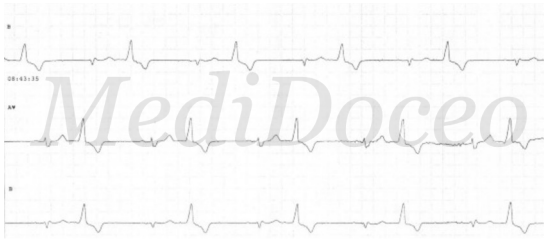

06.02.23 MediDoceo EKG - Kurs 177

177




178

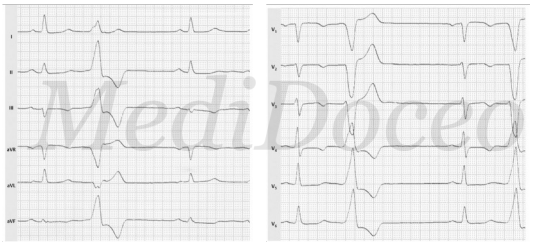
Ventrikulärer Bigeminus – monomorphe VES






179

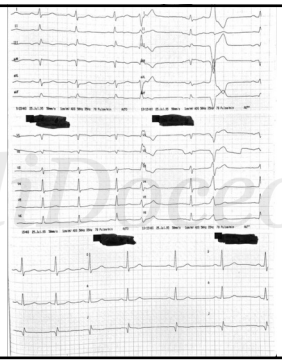
Blickdiagnose:






180

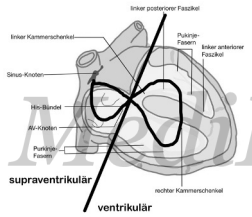
Polytope
Ventrikuläre
Extrasystolen



MediDoceo

06.02.23 181

181




**AV – Knoten Reentry - Tachykardie**

Ausgelöst durch Extrasystole (z.B. im Vorhof)

Weiterleitung durch AV – Knoten

Erregung der Ventrikel

Retrograde Erregung des AV – Knotens (→ Ventrikel → Vorhof)

Erregung des Vorhofs vor der nächsten Sinusaktion

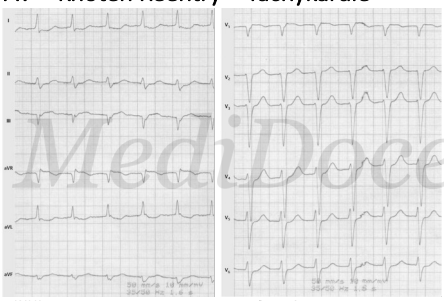
→ Entstehung einer kreisenden Erregung mit Tachykardie

MediDoceo

06.02.23 MediDoceo EKG - Kurs 182

182

**AV – Knoten Reentry – Tachykardie**

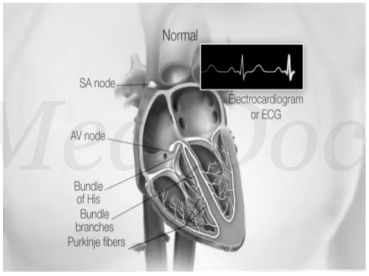


MediDoceo

06.02.23 MediDoceo EKG - Kurs 183

183

## AV – Knoten Reentry - Tachykardie




06.02.23 MediDoceo EKG - Kurs 184

184

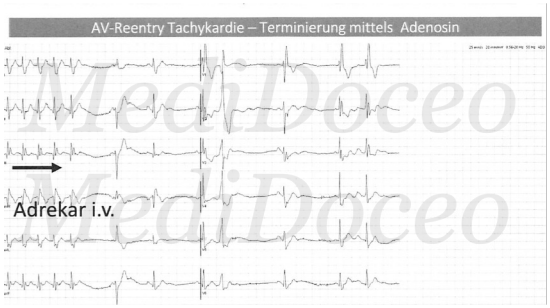
## AV – Knoten Reentry – Tachykardie Terminierung

1. Versuch: Vagus-Reizung
2. Versuch: Adenosin i.v.

2/6/23 MediDoceo EKG - Kurs 185

185

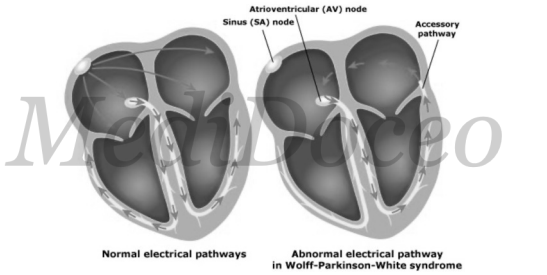
## AV-Reentry Tachykardie – Terminierung mittels Adenosin




MediDoceo EKG - Kurs 186 2/6/23

186

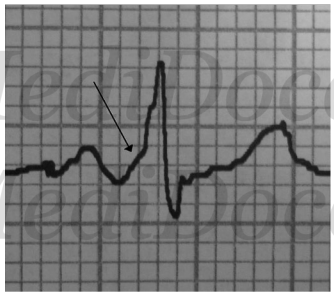
## WPW - Syndrom




MediDoceo

MediDoceo EKG - Kurs 2/6/23 187

187

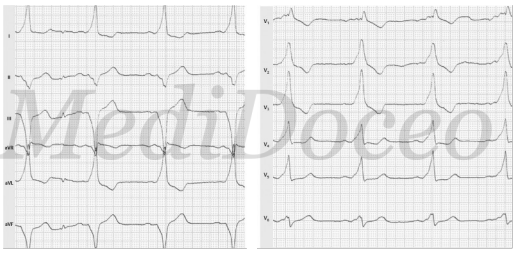


MediDoceo
MediDoceo

06.02.23 MediDoceo EKG - Kurs 188

188

## WPW - Syndrom

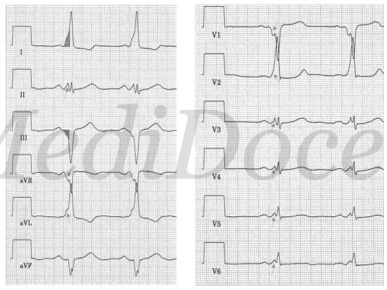


MediDoceo

06.02.23 MediDoceo EKG - Kurs 189

189

## WPW - Syndrom

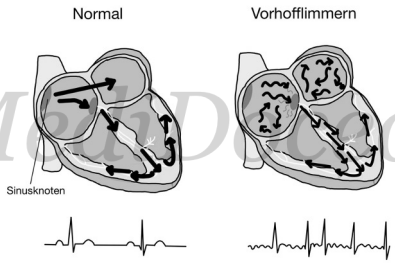



MediDoceo



190

## Vorhofflimmern

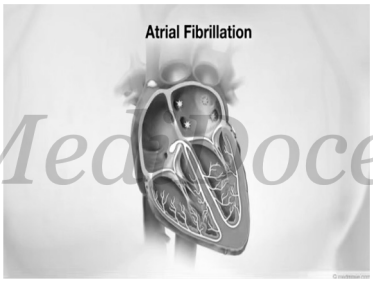



MediDoceo



191

## Vorhofflimmern

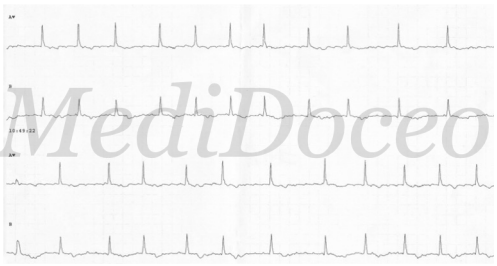



MediDoceo



192

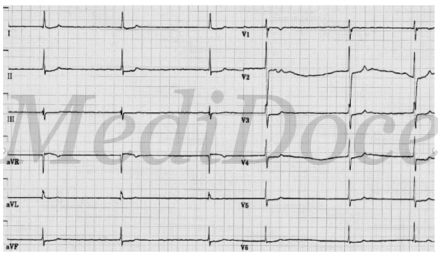
## Blickdiagnose: Vorhofflimmern






193

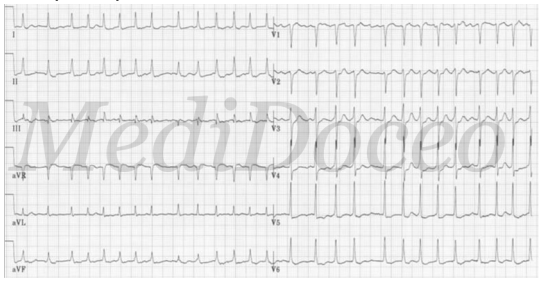
## Bradyarrhythmia absoluta





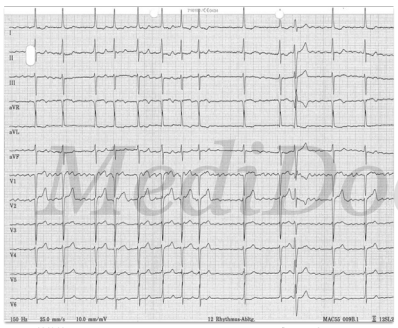

194

## Tachyarrhythmia absoluta bei Vorhofflimmern





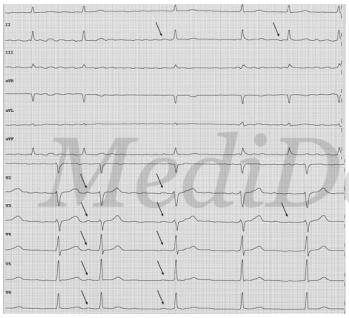

195



Normofrequentes Vorhofflimmern – grobe Wellen

06.02.23 MediDoceo EKG - Kurs 196

196



Feines Vorhofflimmern mit “Pseudo-P-Wellen”

06.02.23 MediDoceo EKG - Kurs 197

197

Vorhofflimmern und Vorhofflattern

Beim Vorhofflattern liegt die Frequenz unter 300 pro Minute

Beim Vorhofflimmern liegt die Frequenz über 300 pro Minute

06.02.23 MediDoceo EKG - Kurs 198

198

## Vorhofflattern

Typisches Vorhofflattern

4 : 1 Überleitung

65/min.

Linkstyp

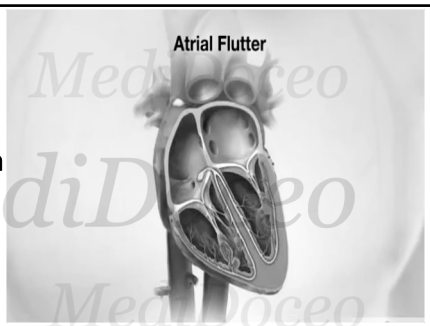
ST – T: soweit beurteilbar, o.B

MediDoceo



199

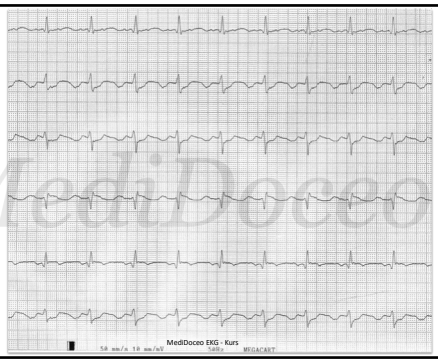
## Vorhofflattern




MediDoceo



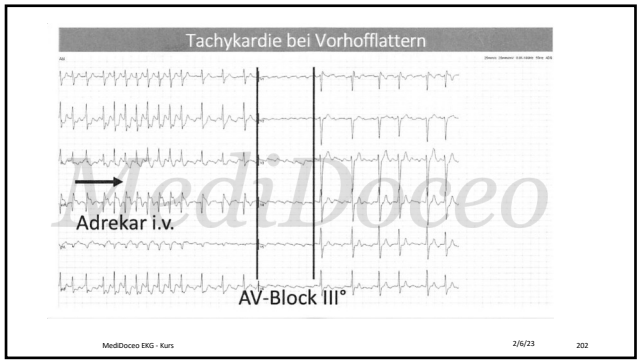
200



MediDoceo



201



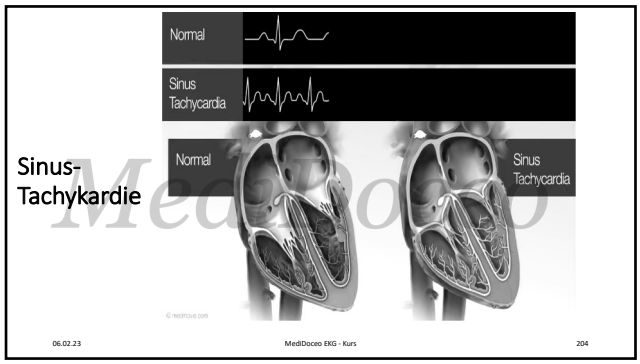

202

## Tachykarde Herzrhythmusstörungen

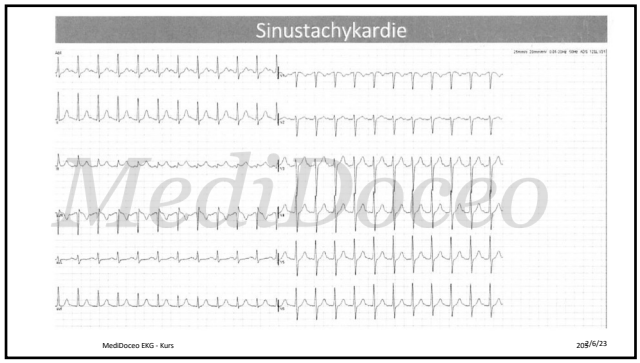
- Sinustachykardie
- Tachyarrhythmie bei Vorhofflimmern
- Tachyarrythmie bei Vorhofflattern
- AV – Knoten - Reentrytachykardie

06.02.23 MediDoceo EKG - Kurs 203

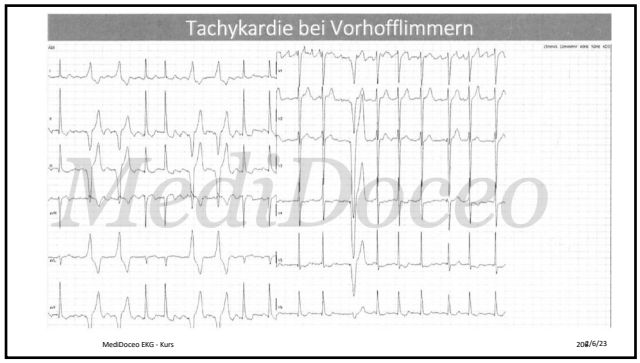
203



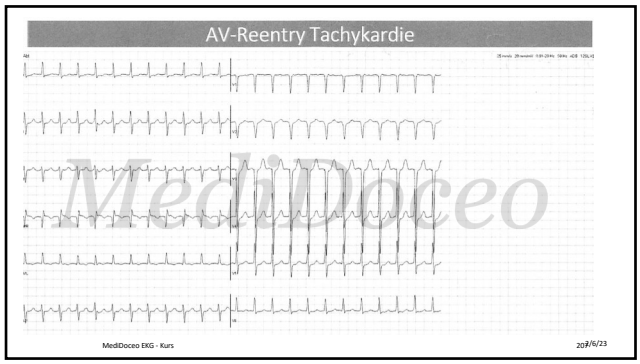

204


Sinustachykardie
MediDoceo
MediDoceo EKG - Kurs
205
5/6/23

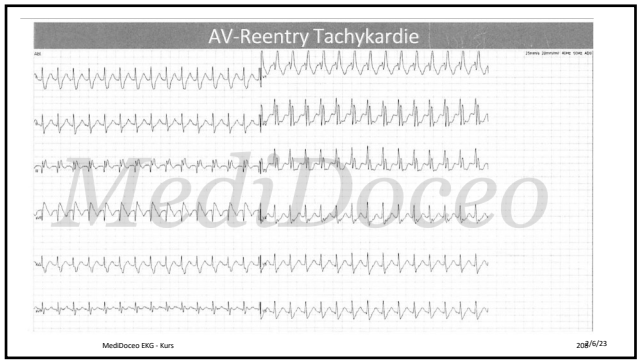
205


Tachykardie bei Vorhofflimmern
MediDoceo
MediDoceo EKG - Kurs
206
5/6/23

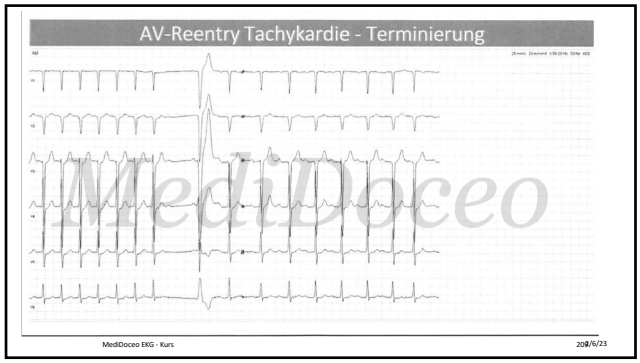
206


AV-Reentry Tachykardie
MediDoceo
MediDoceo EKG - Kurs
207
5/6/23

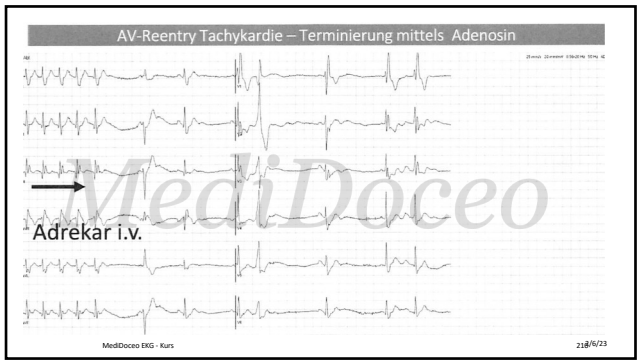
207


AV-Reentry Tachykardie
MediDoceo
MediDoceo EKG - Kurs
208
8/6/23

208

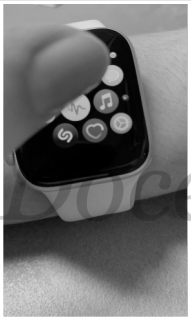

AV-Reentry Tachykardie - Terminierung
MediDoceo
MediDoceo EKG - Kurs
209
8/6/23

209


AV-Reentry Tachykardie – Terminierung mittels Adenosin
Adrekar i.v.
MediDoceo
MediDoceo EKG - Kurs
210
8/6/23

210

EKG – Dokumentation mittels AppleWatch

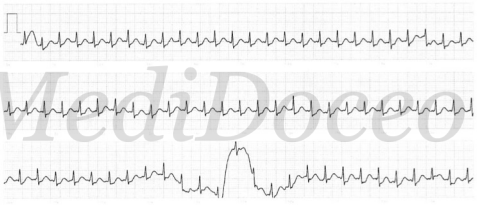


MediDoceo

06.02.23 MediDoceo EKG - Kurs 211

211

EKG – Dokumentation mittels AppleWatch

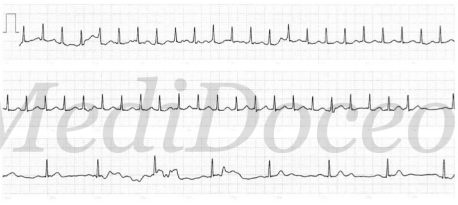


MediDoceo

MediDoceo EKG - Kurs 212/6/23

212

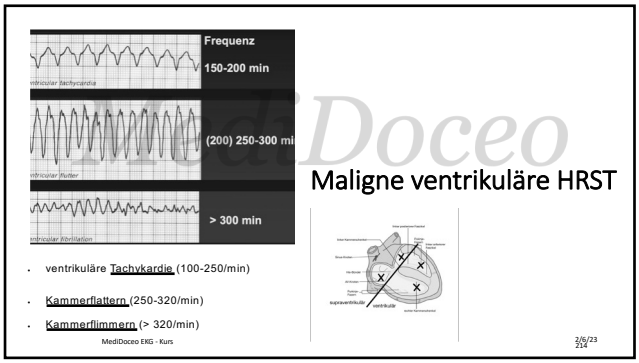
EKG – Dokumentation mittels AppleWatch



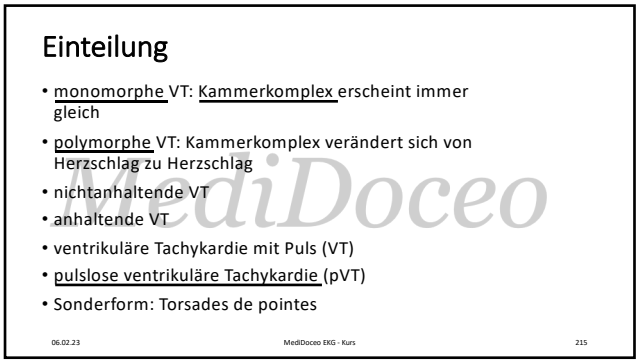
MediDoceo

MediDoceo EKG - Kurs 2/6/23 213

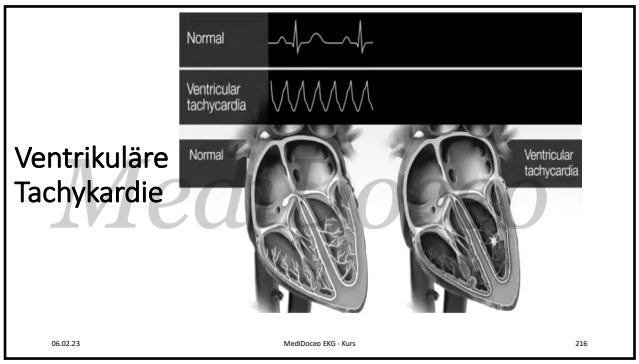
213


Frequenz
150-200 min
(200) 250-300 mi
> 300 min
Maligne ventrikuläre HRST
ventrikuläre Tachykardie (100-250/min)
Kammerflattern (250-320/min)
Kammerflimmern (> 320/min)
MediDoceo EKG - Kurs
2/6/23
214

214

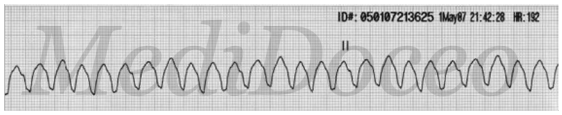

Einteilung
monomorphe VT: Kammerkomplex erscheint immer gleich
polymorphe VT: Kammerkomplex verändert sich von Herzschlag zu Herzschlag
nichtanhaltende VT
anhaltende VT
ventrikuläre Tachykardie mit Puls (VT)
pulslose ventrikuläre Tachykardie (pVT)
Sonderform: Torsades de pointes
06.02.23
MediDoceo EKG - Kurs
215

215


Normal
Ventricular tachycardia
Ventrikuläre Tachykardie
Normal
Ventricular tachycardia
06.02.23
MediDoceo EKG - Kurs
216

216

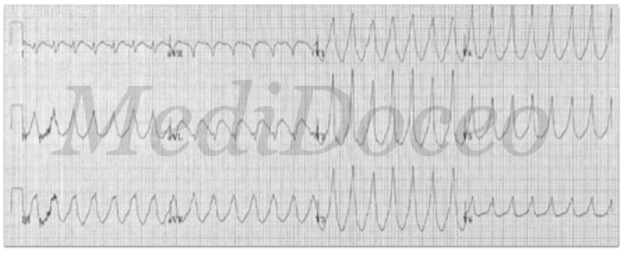
## Monomorphe Ventrikuläre Tachykardie




MediDoceo

06.02.23 MediDoceo EKG - Kurs 217

217



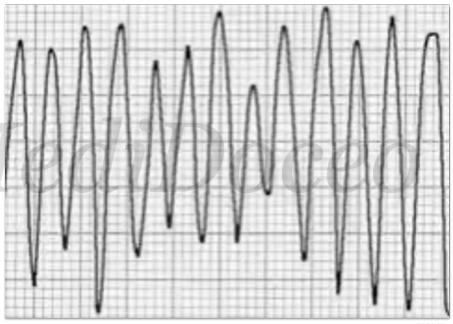
MediDoceo

12-Kanal-EKG einer monomorphen ventrikulären Tachykardie

2/6/23 MediDoceo EKG - Kurs 218

218

## Kammer-Flattern

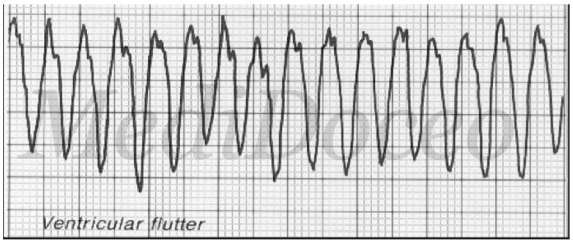


MediDoceo

MediDoceo EKG - Kurs 06.02.23 219

219

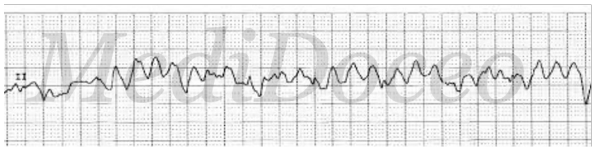
## Kammerflattern






220

## Kammerflimmern





221

Monitor:

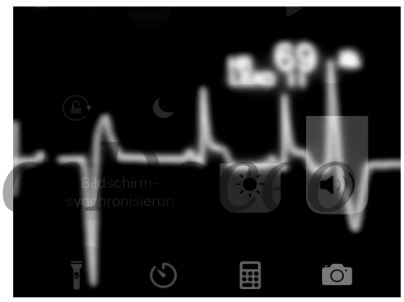
→ SR & ST – Hebung

→ VES

→ VT

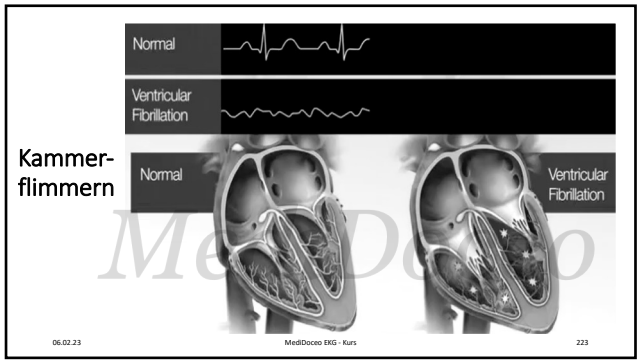
→ Kammerflattern

→Kammerflimmern

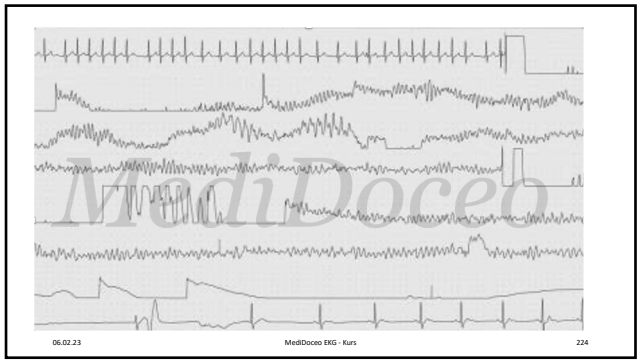




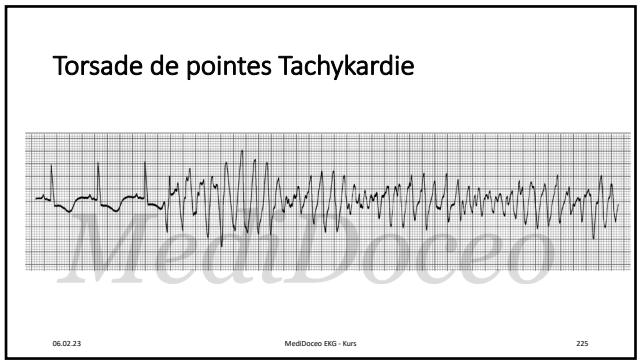
222


Normal
Ventricular Fibrillation
Kammer-flimmern
Normal
Ventricular Fibrillation
06.02.23
MediDoceo EKG - Kurs
223

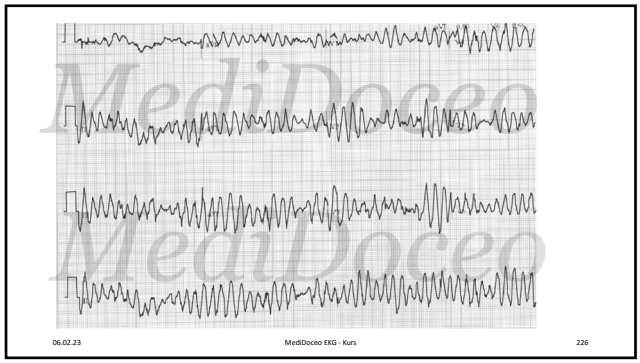
223


06.02.23
MediDoceo EKG - Kurs
224

224

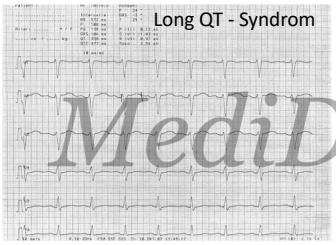

Torsade de pointes Tachykardie
06.02.23
MediDoceo EKG - Kurs
225

225

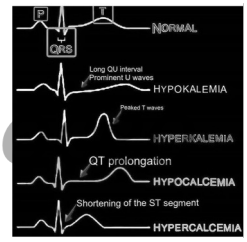



226

Long QT - Syndrom



Calcium und Kalium



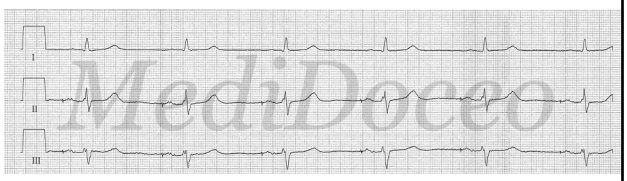



227

Schrittmacher EKG

228

## AAI - Schrittmacher

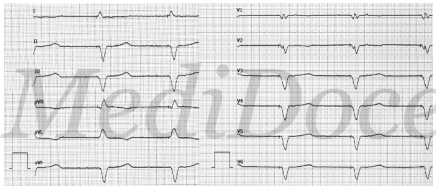



Effektive a**triale Stimulation** (**AAI-Modus**).
Jedem atrialen Spike (bipolare Stimulation) folgt eine Vorhofaktion.
Einthoven-Ableitungen.
Schreibgeschwindigkeit 50 mm/s

06.02.23 MediDoceo EKG - Kurs 229

229

## VVI - Schrittmacher



Effektive **rechtsventrikuläre (apikale) Stimulation** (**VVI-Modus**).
Jedem ventrikulären Spike (bipolare Stimulation) folgt eine Kammeraktion.
Die Vorhöfe werden retrograd erregt;
jedem stimulierten QRS-Komplex folgt eine P-Welle,
z. B. sichtbar in V1 und V2.
Schreibgeschwindigkeit 50 mm/s.

06.02.23 MediDoceo EKG - Kurs 230

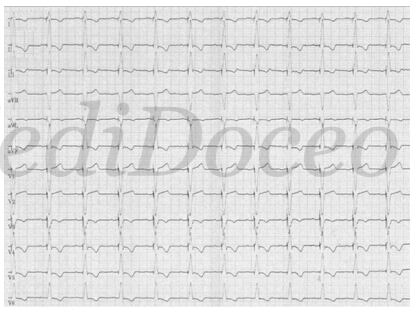
230

## VVI

Effektive **rechtsventrikuläre (septale) Stimulation (VVI-Modus)**.

Die Rechtsabweichung der QRS-Achse & die linksschenkelblockartige Konfiguration der QRS-Komplexe & der relativ schmale stimulierte QRS-Komplex weisen auf eine hoch-septale Lage der Stimulationssonde hin.

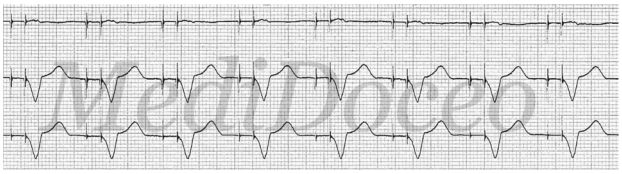
→ Fast regelrechte Erregungsausbreitung in den Ventrikeln.



06.02.23 MediDoceo EKG - Kurs 231

231

## DDD



Durchgehende Simulation im **DDD-Modus** (unipolar).
Die Stimulation erfolgt im Vorhof und im Ventrikel.

MediDoceo



232

## Checkliste – EKG - Schnellschema

- Grundrhythmus und Frequenz
- Initialblick auf die ST – Strecke
- Lagetyp
- Rhythmus
- P-Welle & PQ-Zeit
- QRS – Zacken
- QRS - Form und Breite
- Nochmalige Revision der ST – Strecke inkl. T-Welle
- QT - Zeit

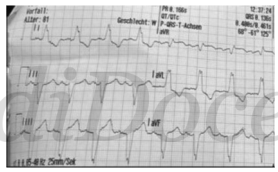
MediDoceo

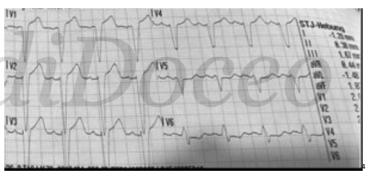


233

## Routine EKG vor TEP - OP

männlicher Patient, 68 Jahre, seit 20 Jahren arterielle Hypertonie



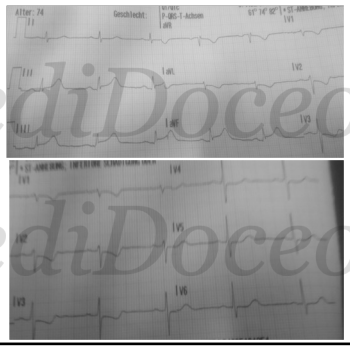


MediDoceo MediDoceo



234

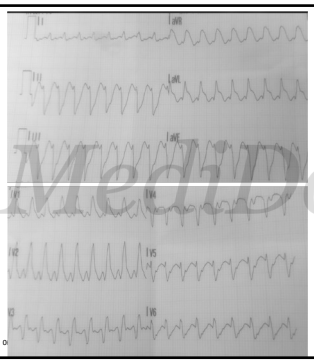
Männlicher Patient,
74 Jahre,
seit einer Stunde
retrosternale
Schmerzen und
Dyspnoe



MediDoceo

06.02.23 235

235



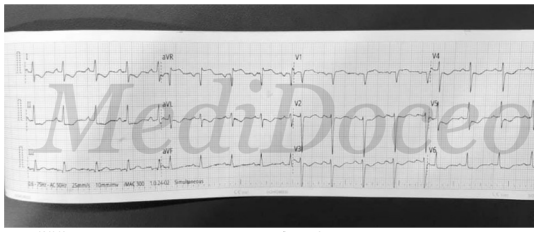
Keine Angaben

MediDoceo

236

236

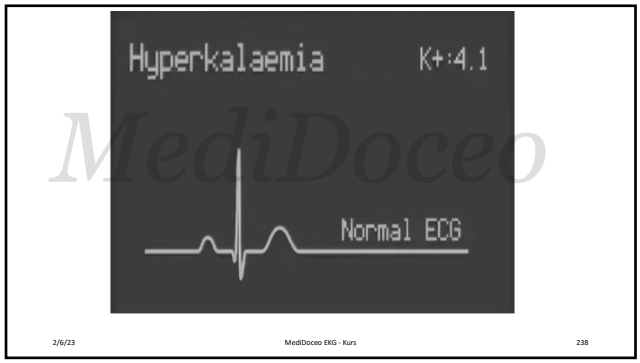
44 jährige Patienten, Angina pectoris



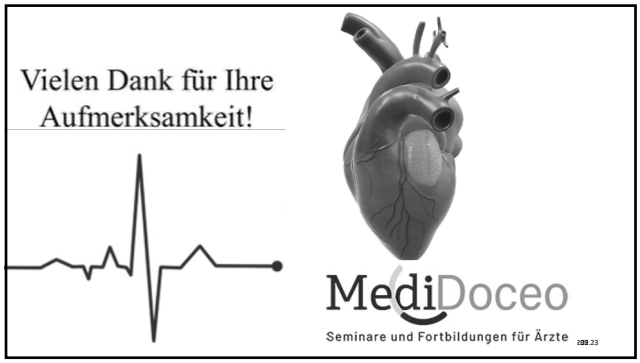
MediDoceo

06.02.23 MediDoceo EKG - Kurs 237

237


Hyperkalaemia
K+:4.1
Normal ECG
MediDoceo
2/6/23
MediDoceo EKG - Kurs
238

238


Vielen Dank für Ihre Aufmerksamkeit!
MediDoceo
Seminare und Fortbildungen für Ärzte
2/6/23

239